FORESTRY ABSTRACTS

VOLUME 18 1957 NUMBER 3

EDITORIAL NOTE

The leading article series will be resumed in Vol. 19 (1).

ABSTRACT SECTION

0. FORESTS, FORESTRY, AND THE UTILIZATION OF FOREST PRODUCTS: GENERAL

For general *regional* accounts see section 90

2395. CHAMPION, SIR H. **The spread of Indian forestry experience and ideas.** *Indian For.* 82 (12), 1956 (612–4).

A note on the influence of Indian forestry and foresters on ideas and practices outside India.

Translations

See Nos. 2547, 2678, 2948, 3286, 3290, 3316, 3318, 3356, 3364, 3409, 3413.

0 (048.1). Bibliographical Lists

See Nos. 2471, 3066, 3110, 3369, 3612.

0 (05). Periodicals. Yearbooks. Directories. Almanacs, Calendars, Diaries

See also Nos. 3609–10.

2396. ***Silvae Genetica.*** J. D. Sauerländer's Verlag, Frankfurt a.M. 6 nos. per year. Price *DM.*30 p.a.

Previously *Zeitschrift für Forstgenetik und Forstpflanzenzüchtung.* Vol. 6, Nos. 1/2, under the new title was issued in Jan./Mar. 1957. Citation in *F.A.*: *Silvae Genet.*

2397. ***Drevársky Výskum. Sborník prác z odboru výskumu dreva.*** Slovenské Vydavatel'stvo Technickej Literatúry, Bratislava. Half-yearly. [Price not stated.] P.R.

Vol. 1, No. 1/2, published in October, 1956, contains 14 original papers on forest-products research subjects in Czech or Slovak, with Russian and English or German summaries. Citation in *F.A.*: *Drev. Výskum.*

0 (084.3/.4). Maps. Atlases

See also Nos. 2424, 2426.

2398. Weltforstatlas. **[World forestry atlas** [part].] Fritz Haller Verlag, Berlin. 1955.

[Cf. *F.A.* 17 No. 3560.] Three further sheets, as follows:—Jugoslavia (location of the woodworking industries, distribution of the main species, % forest area, % coniferous and deciduous forest, % high forest and coppice, forest area per inhabitant, and accessibility of the forests); Algeria, Tunis and Morocco (distribution of most important species, % forest area, and accessibility of forests); Philippines and New Guinea (forest distribution).

2399. **British Columbia atlas of resources.** British Columbia Natural Resources Conference, Vancouver, B.C. 1956. pp. 92.

Contains some 50 maps, with accompanying text and photographs, showing geographical characteristics and distribution and use of resources, with map indices and gazetteer. Includes maps of biotic regions, forest resources, and forest administration.

0 - - 011. Terminology. Nomenclature

See Nos. 2428, 2656, 2671.

0 - - 015. Mathematics. Statistical Methods

See also Nos. 2727, 2833.

2400. DUN, D. B. **The transformation of certain experimental data for valid tests of significance.** *Aust. For.* 19 (2), 1955 (136–40). 4 refs.

Many types of forestry research experiments yield data which, without some transformation, will yield an invalid test of significance. A general procedure for transforming data for analysis is suggested. Examples are given of four methods of transformation appropriate to particular types of experiments, with brief details of analyses with and without transformation. These examples show clearly how misleading conclusions may be obtained from certain results if tests of significance are made without transformation. The advisability is suggested of critically examining any count data from forestry experiments before attempting a test of significance. No attempt is made to describe the derivation of the various transformations, but suitable references are given. *Author's summary.*

1. FACTORS OF THE ENVIRONMENT. BIOLOGY

11. Site Factors: Climate, Situation, Soil, Hydrology (Water Conservation, Soil Conservation and Erosion)

2401. REINHOLD, F. Grundlagen des Waldbaues. [**The foundations of silviculture.**] *Forstarchiv* 27 (3), 1956 (66–71). 101 refs. [G.]

A critical review of modern plant-ecological and site studies and their silvicultural implications.

111. The Atmosphere. Meteorology. Climate and Microclimate

111.2. Radiation and Temperature

See No. 3184.

111.7. Humidity, Evaporation. Clouds etc. Precipitation

2402. ZOBEL, H. Niederschlagsmessungen im Gelände. [**Precipitation measurements in the field.**] *Forstarchiv* 27 (9), 1956 (197–202). 9 refs. [G.g.]

Describes, with illustrations, a new winter-proof automatic-recording rain gauge, heated by propane, designed for making continuous measurements in the field.

111.8. Climatology. Climate and Microclimate

See also Nos. 2672, 2697, 2841, 3200.

2403. AULITZKY, H. Die Bedeutung meteorologischer und kleinklimatischer Unterlagen für Aufforstungen im Gebirge. [**The importance of meteorological and microclimatic data for mountain afforestation.**] *Wetter und Leben, Wien* 7 (8/11), 1955 (241–52). 17 refs. [G.] L.S.

Discusses the need for suitable methods of measuring both single climatic factors and interrelated groups as they affect vegetation in marginal environments, the siting of climatic research stations on representative points on slopes (valley bottoms being frequently unsuitable), detailed factor analysis for the tree species concerned, and the influence of factor distribution on vegetation. This leads to the construction of 'ecograms', i.e. graphical representations of plant communities arranged according to some decisive factor or group of factors and related to the requirements of tree species. The first of these, covering wind and snow relations, is in active preparation at Obergurgl research station (Tyrol). Data are given on the effect of vegetative cover and shade on soil and air temperature, and the influence of wind and sun on depth and duration of snow cover as influenced by altitude and tree growth, showing a snow-retention effect of even very young trees (*Pinus cembra* ca. 2 m. high) comparable to that of high forest. Plant communities characterized by *Alectoria ochroleuca*, *Loiseleuria procumbens* and *Rhododendron ferrugineum* respectively were shown to be typical for certain snow conditions and capable of serving as indicators of the suitability of sites for afforestaion.

2404. PASÁK, V. Vliv porostního pláště na mikroklima lesa. [**Effect of shrubby undergrowth on stand margins on the forest microclimate.**] *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 29 (11), 1956 (825–58). 24 refs. [Cz.cz.russ.e.*russ.e.*]

Measurements of wind velocity, air temperature at 100 and 200 cm., soil temperature, air humidity and evaporation were made on the edge of a stand of Scots Pine (50%)/Oak (40%)/Beech (10%); density 0·6, mean height 12 m., age 70 years, with sparse Oak, Hornbeam and Beech undergrowth; alt. 390 m., S. aspect, ca. 572 mm. annual precipitation; mean temperature 8·0° C.; prevailing winds S.W., W. and N.W. Two sites were chosen: one where the forest edge was protected by a relatively dense belt of undergrowth (*A*), and the other without any undergrowth (*B*). It was found that (*A*) strongly reduced the wind velocity, whereas in (*B*) the wind generally formed eddies in the stand, often at increased velocity. However, in sunny weather, even (*B*) showed a strong decrease of wind velocity; with (*A*), almost complete calm is obtained behind the undergrowth. When sunshine is not very bright, temperatures inside and outside the stand are almost equal, the undergrowth itself having a lower temperature, which bright sunshine accentuates. In (*A*) the relative humidity increased directly behind the undergrowth, whereas in (*B*) it remained low well into the stand, a factor having a considerable effect on evaporation. Soil moisture is lower in (*A*) than in (*B*).

2405. GÖHRE, K., and LÜTZKE, R. Der Einfluss von Bestandesdichte und -struktur auf das Kleinklima im Walde. [**The influence of stand density and structure on the forest microclimate.**] *Arch. Forstw.* 5 (7/8), 1956 (487–572). 26 refs. [G.g.]

The stands investigated were pure, even-canopied Scots Pine, one in the pole stage and one older, with densities of 1·0 and 0·8 respectively; a gappy Pine overwood with two gappy Beech understoreys, all canopies irregular, mean density 0·7; a similar stand (density 0·5); young planted Douglas Fir in an irregular nurse crop of Beech poles (mean density 0·3); young Pine planted under a Pine shelterwood (0·1); and young planted Pine on a small and on a large area, both without shade. The variation of soil and air temperature, vapour pressure, relative humidity and potential evaporation, was studied during 24 hours of selected days of quiet anticyclone weather, mainly in September, and some in March, from 0·25 m. to the canopy top (20·5 m.). Soil temperatures at 2-hourly intervals ('tautochrones') are graphed for 5 different depths; isopleths (lines of equal value) of the other elements are charted for the 8 stands at 0·25 m. above ground. The data are discussed in detail, particularly as to the effects of cloud and the conditions before and after the flushing of the Beech. The light overwood of 90-year Pine as a protection against late frost is considered worth while but the retention of Beech underwood for the same purpose is manifestly incorrect.

2406. SETH, S. K., and DABRAL, S. N. **The effect of forest cover on air and soil temperatures during frost period.** *Indian For.* 83 (2), 1957 (91–6).

Comparison of soil and air temperatures (*a*) inside a plantation and (*b*) in the open, during a period of frost at Dehra Dun, demonstrated the ameliorating effect of forest cover on extremes of temperature: the lowest temperature in (*a*) was 30·9° F., and that in (*b*) 22·6°, and there was very little temperature inversion in (*a*). A list is given of species that were affected by this frost, with some indication of the degree of damage.

2407. SPURR, S. H. **Local climate in the Harvard Forest.** *Ecology* 38 (1), 1957 (37–46). 18 refs.

A two-year study of local climatic variations (1943–45) coupled with other weather data over a period of 36 years, indicates that temperatures vary considerably from place to place. Concave areas are characterized by greater temperature extremes and shorter growing seasons; convex areas by lesser extremes and longer growing seasons. In a dense plantation, the extremes are greatly moderated. In all cases, however, the mean annual temperature is little affected. The variation in local climate tends to explain the concentration of northerly species such as Red Spruce, Black Spruce, and Tamarack in bogs characterized by extremes of cold and short growing seasons. It seems correlated with the absence of mature White Ash on frosty sites, and may help to explain some features of the distribution of species having a southerly range. *From author's summary.*

2408. CHAMPION, SIR H., and BRASNETT, N. V. **Regional climates and vegetation.** *Unasylva* 11 (1), 1957 (14–8).

An excerpt from a forthcoming FAO publication, 'Choice of tree species for planting'. It deals with the factors that should guide the forester in deciding which species to plant or to favour.

2409. JACKSON, J. K. **The importance of unusual climatic events in forestry.** *Sylva, Edinb.* No. 37, 1956/57 (18, 20–1).

Gives some examples of the importance of e.g. a wet year for afforestation or natural regeneration in an arid zone, a very dry year in relation to fire in normally fire-resistant forest, violent storms in areas normally free from gales, and desiderates climatic data dealing with such points, to supplement the usual averages.

114. Soil. Soil Science

114.1. Soil Physics

See also Nos. 2404–6, 2672, 2697, 2970, 3192.

2410. STEINBRENNER, E. C. **The effect of repeated tractor trips on the physical properties of forest soils.** *Northw. Sci.* 29 (4), 1955 (155–9). 2 refs. L.S.

Infiltration rate, volume of macroscopic pores, and bulk density were measured. When the soil was dry, 4 trips with an HD20 tractor reduced the macroscopic pore space by ½, and the infiltration rate by $> 80\%$; the same effects were obtained after 1 trip on moist soil.

2411. BEAUCORPS, G. DE. Contrôle électrique de l'humidité des sols. Premier aperçu sur les rapports entre l'eau et la forêt. **[Electrical measurement of soil moisture. A first glimpse of the relations between water and the forest.]** *Repr.* from *Travaux de la Section de Pédologie, Société des Sciences Naturelles et Physiques de Maroc, Rabat* 10/11, 1955/56 (41–57). 6 refs. [F.f.e.]

The study reported on has already been described in another paper [see *F.A.* 17 No. 3574]. The present paper also describes in some detail the principle, construction, and method of using the Colman Fiberglas Soil Moisture Instrument which determines m.c. of soil from its electrical resistance.

114.2. Soil Chemistry

See also Nos. 2415, 2418–9, 2421–3, 2583, 2590, 2962.

2412. **[Spectrochemical analysis.]** *Soil Sci.* 83 (1), 1957 (1–83). 115 refs.

The entire issue consists of 7 papers by leading authorities on the use and organization of the spectrochemical technique for soil and plant nutrition research, with examples illustrative of its usefulness and its limitations.

2413. LHOTSKÝ, J. Vliv mechanické přípravy zabuřenělé holiny k zalesnění na chemické změny v půdě. **[Mechanical preparation for afforestation of a weed-overgrown deforested area and its effect on chemical changes in the soil.]** *Sborn. čsl. Akad. zeměd. (Lesn.)* 29 (6), 1956 (385–404). 38 refs. [Cz.cz.russ.g.*russ.g.*]

The following changes were recorded in the course of 3 years in the soil of the trial area already described in more detail [see *F.A.* 16 No. 1621]: (1) increase in the amount of (*a*) mineral nutrients (all fundamental elements); (*b*) readily exchangeable cations; (*c*) nutrients available to plants; (2) more N and nitrates than at the beginning of the trial; (3) increase in the % of organic substances, and a more favourable C/N ratio; (4) a progressive humification but with the humus not saturated, and (5) increase in soil acidity about the 2nd and 3rd year, followed by a decrease.

114.3. Soil Formation. The Soil Profile and its Development. Litter, Humus etc.

See also No. 2590.

2414. SUSMEL, L. Condizioni eco-pedologiche e possibilità della rinnovazione naturale nella foresta di Longarone. **[Ecological and soil conditions and the possibility of natural regeneration in the forest of Longarone.]** *Ital. for. mont.* 11 (6), 1956 (233–44 + 22 photos). [It.it.f.]

A chapter from a comprehensive work to be published shortly. A detailed study was made of soil profiles and development in a degraded Silver Fir/Spruce forest with some relict Beech, in relation to existing plant associations and the possibility of encouraging natural regeneration. The soils belong to the series of pararendzinas and brown soils originating in a calcareous parent rock, and are illustrated by photographs and diagrams.

2415. MACLEAN, K. D., and DELONG, W. A. **On the carbohydrate component in leaf extracts and in leachates obtained under forest canopy.** *Canad. J.*

agric. Sci. 36 (4), 1956 (267–75). 13 refs. O.R.E.

Presents results of experiments to determine seasonal variations in the carbohydrate content of (*a*) leachates, (*b*) extracts, from the foliage of various trees (e.g. *Fagus grandifolia*, *Acer saccharum*, *Populus grandidentata*, *Pinus strobus*) and from some A horizons (under Beech and conifers), and (*c*) canopy-drip solutions (Beech and Maple), and describes the methods employed. The major part of the carbohydrates appeared to be polymeric. No consistent relation was found between the carbohydrate content of (*a*) and (*b*) and their Fe-saturation-capacity values. [Cf. *F.A.* 13 No. 24; 15 No. 3192.]

2416. TRIMBLE, G. R., JR., and LULL, H. W. **The role of forest humus in watershed management in New England.** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 85, 1956. pp. 34. 36 refs.

A review of literature (all but two references being American) under the heads: humus development, classification [cf. *F.A.* 15 No. 22], physical properties, infiltration and percolation, and water storage, with suggested subjects for research under each.

2417. MAŘAN, B., and LHOTA, O. Lesní humus jako rozhodující faktor v intensitě vodní erose. **[Forest humus as a decisive factor in the intensity of water erosion.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 29 (3), 1956 (161–92). 64 refs. [Cz.cz.russ.g.]

Results are tabulated of artificial-rain tests in four 25-year plantations near Prague (mean annual precipitation 480 mm., mean annual temperature 8·8° C., clayey diluvial soil with gravel) consisting of *Larix decidua* (*A*), *Quercus rubra* (*B*), *Pinus nigra* (*C*), and *Q. rubra* (*D*), all on 21–28% slopes, *A*, *C* and *D* having raw-humus layers and *B* on a bare soil without humus, in order to determine the effect of raw humus on the rate of run-off and on the amount of nutrients and soil particles washed away. The water infiltration tests gave the following relative infiltration times *A*/*B*/*C*/*D* 1 : 7·9 : 2·0 : 1·4. The raw-humus layer was found to reduce the run-off rate substantially. The relative amounts of eroded soil (for *A*/*B*/*C*/*D*) were 3,350 : 26,320 : 1 : 1·5, roughly proportional results being obtained for the erosion of mineral nutrients.

2418. GUPTA, R. S. **Changes in soil on the afforestation of agricultural land.** *Proc. 8th silv. Conf., Dehra Dun 1951* Part 2, 1956 (203–5).

Periodical examinations have been made of the soil under plantations established at Dehra Dun on land that had been under agriculture before 1927. The species mainly used were (*a*) *Shorea robusta*, (*b*) *Acacia catechu*, and (*c*) *Pinus longifolia*. Some of the changes noted are: (1) Increase in CO_2 accumulation at a depth of ca. 18 in. under all 3 species. The subsoil under (*a*) shows a lowering of pH and increase in exchangeable acidity in comparison with the topsoil; this development is less marked under (*c*). (2) The organic matter of the topsoil is increasing very slowly and is noticeable only in the top 3 in. after nearly 20 years of forest conditions. (3) The correlation between CO_2 accumulation and biological activity in the soil, that occurs in temperate regions, has not been observed at Dehra Dun. A rise in CO_2 accumulation in August (4·4% compared with 0·1% at other seasons) is apparently due to root respiration; it accumulates in the subsoil during the rains when the wet topsoil seals it off. The maximum mortality of *S. robusta* regeneration occurs during August and may be connected with this phenomenon.

2419. UPADHYA, S. **Soil formation under forest cover.** *Bull. bot. Soc. Univ. Saugar* 7 (1), 1955 (3–13). From *abstr.* in *Biol. Abstr.* 30 (8*D*), 1956 (No. 23851).

The author studied the effect of the litter of 10 forest tree species on the physical and chemical properties of their soils and concludes that: (*a*) moisture content, water-holding capacity and field capacity increase with the organic matter; (*b*) soil structure, texture and aggregation are improved; (*c*) pore volume and air capacity increase when organic matter is added to the soil; (*d*) the downward movement of soluble materials with percolating water gradually impoverishes the surface soil; (*e*) cation exchange capacity increases with organic matter, and (*f*) colloid particles attain high H-ion content and correspondingly low content of metal cations.

114.4. Soil Classification. Soil Types

See also No. 2414.

2420. ÈVALJD [EHWALD], E. O nekotoryh osnovnyh tipah lesnyh počv i ih naimenovanii v Germanii. **[Some of the chief forest soil types in Germany and their nomenclature.]** *Počvoved.* 1956 (9), (19–33). 9 refs. [Russ.] A.P.B.

The text of a paper delivered at the International Congress of Soil Scientists, Moscow, 1956. The author describes brown forest soils, podzols and pseudogleys and some transitional types, taking as illustrations characteristic soil profiles from different parts of Germany.

2421. YAMAYA, K. **[Studies on 'Hiba' (*Thujopsis dolabrata*) natural forest soils in the southern district of the Tsugaru peninsula (Aomori Regional Forestry Office).]** In *Forest Soils of Japan, Report 5*, Government Forest Experiment Station, Meguro, Tokyo. 1956. pp. 1–132 + 5 plates. [Jap.e.*e.*]

The location, topography and climate of the area are briefly described. Soils were classified as in the National Forest Survey [see *F.A.* 15 No. 3200], with the broad divisions into brown forest soils, podzolic soils, mineral groundwater soil, black soil and flood-plain deposit, the first two accounting for 87 and 6% respectively of the total. The following properties were studied: moisture content and field capacity; thickness of A_0 horizon and the C/N ratio; types of humus; soil acidity; base exchange capacity and degree of base unsaturation; and leaching and accumulation of mineral colloids. Growth of Hiba is better on wet clayey than on dry sandy soils; but on podzolic and dry soils there is plentiful natural regeneration, with rapid early growth, compared with poor regeneration and slow growth on wet soils. The podzolic soils are found at 150–300 m. altitude and are fairly moist, and rootlets of Hiba are abundant in the surface layer; these soils probably differ in genesis and properties from the podzols

under Beech in the sub-alpine regions [cf. *F.A.* 14 No. 26]. The wet soils are fertile and suitable for planting Japanese Cedar [*Cryptomeria japonica*?].

2422. YAMAYA, K., YAMADA, K., SASAMORI, K., *et al.* **[Description of soils of the Kiraichi, Iizume, Uchimappe I, Uchigata, Uchimappe II, Yomogida national forests.]** In *Forest Soils of Japan, Report 7*, Government Forest Experiment Station, Meguro, Tokyo. 1956. pp. 133–52 + 1 map. [Jap.]

2423. **Forest soils of Japan. Report 4.** Government Forest Experiment Station, Meguro, Tokyo. 1956. pp. 130 + 28 photos. Many refs. [Jap.e.]

[Cf. *F.A.* 16 Nos. 33–5.] Contains papers on the soils of (1) The Dando national forest (*Y. Mashimo* and *T. Kubo*); (2) the Ena national forest (*M. Mukuno* and *H. Taniguchi*); (3) the Kuguno national forest (*J. Fujikawa, H. Taniguchi* and *N. Kashiwagi*). Each paper includes data on chemical and physical properties of the soils, their vegetation, and growth of species (*Chamaecyparis obtusa, Larix leptolepis, Cryptomeria japonica* and *Pinus densiflora*) planted on the different soil types.

2424. **[Soil maps: Forest soils of Japan. Report 6. Dando (Nagoya 1); Ena (Nagoya 2); Kuguno (Nagoya 3).]** Government Forest Experiment Station, Meguro, Tokyo. 1956. [Jap.]

Contains 5 maps, scale 1 : 20,000, illustrating the report containing papers on the soils of the 3 districts.

2425. IBARAGI, C., KURITA, A., ABUKAWA, H., *et al.* **[Forest soils of Japan. Report 7. Soils of the national forest in the northern part of Akita prefecture.]** Government Forest Experiment Station, Meguro, Tokyo. 1956. pp. 153 + 5 plates. 37 refs. [Jap.e.*e.*]

Includes data on topography, the different soils and their vegetation, and the growth of different forest species, with recommendations on choice of species and on the use of natural or artificial regeneration. There are many illustrations, graphs and tables.

2426. **[Soil maps: Forest soils of Japan. Report 7. Akita No. 1.]** Government Forest Experiment Station, Meguro, Tokyo. 1956. [Jap.]

Contains 6 maps, scale 1 : 20,000, illustrating the report.

2427. MUIR, A., ANDERSON, B., and STEPHEN, I. **Characteristics of some Tanganyika soils.** *J. Soil Sci.* 8 (1), 1957 (1–18 + 4 photos). 14 refs.

Includes profile descriptions, fine-earth analyses, and mineralogical details of red loams, pallid soils, mbuga and black valley soils, derived from lower basement-complex rocks, carrying secondary bush and *Commiphora* thicket at Kongwa [Central Province] and *Brachystegia/Julbernardia* forest, and *Pterocarpus/Ostryoderris/Combretum* with tall grass or Bamboo [*Oxytenanthera*] at Nachingwea [Southern Province].

2428. MALI, L. [Editor.] Suosanasto. **[Peatland terminology.]** Suoseura r.y., Helsinki. 1956. pp. 18 + [6[. [Fi.G.Sw.E.]

Comprises 250 terms arranged under the German, with equivalent or definitions in Finnish, Swedish and English. There are separate indexes to the last 3 languages. The terminology has been prepared as part of a proposed agricultural dictionary and terms relating particularly to forestry have not necessarily been included.

114.5. Soil Fertility. Soil Toxicity. Soil Depletion and Exhaustion

See also Nos. 2583, 2622, 2647, 2654, 2962–3, 3190–1, 3601.

2429. MÜLLER, E. H. Die Bodenkartierung zum Zwecke der forstlichen Standorterkundung in Nordrhein-Westfalen. **[Soil mapping as an aid in forest site research in Nordrhein-Westfalen.]** *Allg. Forst- u. Jagdztg.* 127 (8/9), 1956 (158–64). 12 refs. [G.g.]

A discussion of the methods used in the preparation of soil maps as a basis (jointly with vegetation maps) of a forest site classification for the region, and observations made in the course of the work. On the (genetical) soil-type maps (*Bodentypenkarte*) base content is indicated by colour, and degree of podzolization etc. by symbols. Traditional, chiefly textural, soil categories (*Bodenarten*) are mapped separately. Humus forms are characterized by their C/N ratio, and the relation between humus forms, C/N ratio, soil development, V values (% of exchangeable bases in the total sorption capacity) and nutritional conditions are discussed, with local examples; also the relation of plant communities and the growth requirements of a number of tree species—e.g. Ash, Oak, Beech, Douglas Fir and Larch, with nutritional categories. Other subjects dealt with are the need for favourable nutritional conditions for Poplar, the greatly varying development of soils under Spruce, and site amelioration, chiefly by Ca and N fertilizers, and its prospects on different soils.

2430. HUNTER, J. H., and HAMMAR, H. E. **Relation of oil contents of Pecan kernels to chemical components of leaves as a measure of nutrient status.** *Soil Science* 82 (4), 1956 (261–9). 23 refs.

Correlation coefficients between the oil in nut kernels and the N, P, K, Ca and Mg in the leaves were used as a guide to the nutrient status of trees. Data from 220 trees of 3 varieties of *Carya illinoensis* for periods of 1–3 years were used, and several unbalanced nutrient conditions were identified.

2431. STAPELFELD, E. Over mossen in Drentse lariksbossen en hun oecologie. **[Bryophytes in Larch forests of Drenthe and their ecology.]** *Buxbaumia, Amsterdam* 9 (3/4), 1955 (38–48). 4 refs. [Du.e.] L.S.

In 46 areas in 20- to 30-year Larch forests, 5 species of liverworts and 34 of mosses were found. Edaphic relationships were studied. Ten species were found only on soils with poor to medium P_2O_5 content and 5 only on soils poor in nitrogen. *Campylopus flexuosus, Thuidium tamariscinum, Ptilidium ciliare* and *Leucobryum glaucum* occur in both groups. Soil moisture appeared to be less important for species distribution. On the

sites examined pH ranged from 3·7 to 5·0; *Ptilium crista-castrensis*, *Ptilidium ciliare* and *Hylocomium splendens* were found only below pH 4·5.

114.6. Soil Biology

See also No. 2758.

2432. THORNTON, R. H. **Fungi occurring in mixed Oakwood and heath soil profiles.** *Trans. Brit. mycol. Soc.* 39 (4), 1956 (485–94). 30 refs. O.B.D.

A study of the fungi found in a brown forest soil in Nottinghamshire and in a podzol soil developed from the former after mixed Oakwood had been replaced by *Calluna vulgaris*.

2433. SHIPMAN, R. D. **Quantitative distribution: forest soil microorganisms in a Yellow Poplar plantation.** *Amer. Midl. Nat.* 54 (2), 1955 (433–42). 5 refs. B.A.P.

Comparative estimates of total profile microbial numbers appear to be of limited value in assessing site quality; additional edaphic and micro-environmental data are necessary for a valid interpretation of the quantitative counts of organisms. No direct relationship was found between number of bacteria, fungi and actinomycetes and the growth of immature stands of forest-grown *Liriodendron tulipifera*. *From author's summary.*

2434. ROSA, K. Mikroedafon smrkového a dubového porostu polesí Slapy. **[The micro-edaphon of a Spruce and an Oak stand in the Slapy forest district [Bohemia].]** *Sborn. čsl. Akad. zeměd. (Lesn.)* 29 (1), 1956 (45–62). 11 refs. [Cz.cz.russ.g.]

The Oak stand was found to contain 61 species of protozoa and algae; the Spruce 35. These are listed and described, with some illustrations. [Sampling depth not stated.]

2435. RONDE, G. Zur Auslesemethode der Waldboden-Kleinfauna. **[Methods of extracting the microfauna of forest soils.]** *Z. angew. Ent.* 36 (3), 1954 (363–6). [G.g.] O.H.

Describes apparatus—a series of funnels with cone-shaped lids containing a light, and exchangeable sieves of different meshes—developed and used at Munich for ascertaining the numbers of Acarina, Collembola etc. in soil samples.

116. Hydrology. Water Conservation, Soil Conservation and Erosion

See also Nos. 2416–7, 2814, 2818–21, 3619.

2436. JOHNSON, E. A., and DILS, R. E. **Outline for compiling precipitation, runoff, and groundwater data from small watersheds.** *Sta. Pap. Stheast. For. Exp. Sta.* No. 68, 1956. pp. 41.

A revision of *Tech. Note Stheast. For. Exp. Sta.* No. 34, first issued in 1938 by C. R. Hursh, with a new section on groundwater inventories.

2437. BLEASDALE, A. **Afforestation of catchment areas.** *Emp. For. Rev.* 36 (1), 1957 (59–66). 19 refs.

A brief review is given of the possible influences of forests on the water resources of an area with particular reference to fog-drip, erosion, sediment load, and ground storage. Evaporation and transpiration from vegetation are discussed in relation to meteorological conditions. The theory is examined that loss of water from evapo-transpiration can be estimated by considering the aero-dynamics and heat balance over the area and determining the interacting radiation and advection effects. This method has so far been applied only to uniform level surfaces, and for catchment areas significant modications concerning elevation, slope and aspect may be necessary. In introducing tree vegetation, important aspects to be considered are the nature and colour of foliage, and the grouping of trees in the stand. Need for research on these and related points is stressed. [Cf. *F.A.* 18 No. 50.]

2438. KIRA, H. **Interception of rainfall by the crown of a fruit-tree.** *Tech. Bull. Kagawa-Ken agric. Coll.* 7 (2), 1956 (207–12). [E.jap.] A.P.B.

Contains data for various fruit trees, and some comparable figures for Pine, on total interception, including storage, evaporation and stem flow, size of drops dripping from canopy etc.

2439. GRUNOW, J. Erfassung zusätzlicher Niederschlagsmessungen am Waldboden aus Nebelablagerungen. **[Measuring additional precipitation on the forest floor from fog condensation.]** *Wetter und Leben, Wien* 7 (8/11), 1955 (262–3). [G.] L.S.

On the Hohenplissenberg (Bavaria) at 960 m. alt. it was found that fog condensation moisture amounted to ca. 20% of liquid and ca. 15% of solid precipitation inside forest stands, and 57% and 45% respectively on their margins. Further measurements on similar lines are considered necessary and methods are briefly discussed.

2440. POLSTER, H. Gesichertes und Ungesichertes über den Wasserhaushalt des Waldes. **[Factors certain and uncertain in the water economy of forests.]** *Forst u. Jagd* 4 (7; 8), 1954 (257–8; 302–5). 36 refs. [G.g.]

Discusses, on the basis of German, Swiss and Russian literature, the various methods of measuring and estimating transpiration of single plants and whole stands, and tabulates the often conflicting figures (including the author's own) presented. Interception and evaporation are touched upon.

2441. ZELENÝ, V. O významu břehových porostů pro hospodaření s vodou. **[Importance of stands along banks for water management.]** *Sborn. čsl. Akad. zeměd. (Lesn.)* 29 (11), 1956 (775–92). 17 refs. [Cz.cz.russ.e.*russ.e.*]

Microclimatic measurements made in 1953 and 1954 on two mountain torrents in the Beskid Mts. showed that, in periods of low flow, evaporation from torrents with wooded banks was 35–42% less than from those completely exposed.

2442. LULL, H. W., and STOREY, H. C. **Factors influencing stream-flow from two watersheds in northeastern Pennsylvania.** *J. For.* 55 (3), 1957 (198–200). 7 refs.

A marked difference in stream-flow is noted from the catchments of 2 tributaries of the Delaware, the Lehigh and the Lackawaxen, that have the same climate. The Lackawaxen has a much greater variation in its rate of flow than the Lehigh.

Differences are attributed to land use and soils; the Lehigh watershed has infertile, well drained, stony and sandy loams, and forest cover. The Lackawaxen watershed has more fertile but less well drained soils, and a large % of the land is devoted to agriculture.

2443. ANDERSEN, H. E., and JAMES, G. A. **Watershed management and research on salmon streams of S.E. Alaska.** *J. For.* 55 (1), 1957 (14–7). 7 refs.

Stresses the need for proper multiple-use management of water and timber resources and describes a project now in progress to study the physical effect of logging on salmon streams.

2444. YAMANLAR, O. Gediz nehri yağış havzasında vuku bulan toprak erozyonu ve demirköprü barajının siltasyondan korunması imkânlarına dair araştırmalar. **[Soil erosion control studies in the [upper] Gediz River Basin to reduce siltation of the Demirköprü Hydro-electric and Irrigation Dam.]** TC Nafıa Vekaleti, Elektrik İşleri Etüt Idaresi, Genel Direktorlügü, Ankara. 1956. pp. 19 + 1 tbl., 64 photos, 5 maps. [Turk.]

A detailed study of an important forest catchment of 2700 sq. miles in Turkey, N.W. from Ankara, originally entirely covered with mixed Pine (chiefly *Pinus nigra* and *P. brutia*), Juniper and hardwoods (chiefly *Quercus aegilops*, *Q. infectoria* and *Q. cerris*) but now critically denuded through chronic encroachment and abuse. The several causes and their effects are discussed in detail and recommendations made for rehabilitation, including a replanting programme based on soil surveys and appropriate land use (both mapped).

2445. YAMANLAR, O. Marmara havzası ve bilhassa Yalova mıntıkası için arazi taonifinin erozyon kontrolu üzesine yapacağı tesizler. **[Land classification on the basis of soil conservation in Marmara region (Turkey) with special reference to Yalova District.]** *Istanbul Üniv. Yay.* No. 697 (*Orm. Fak.* No. 42). 1956. pp. vi + 98 + 7 maps. [Turk.e.]

The region comprises 5·5 million ha. with 25% forest land. The climate is a homoclime of the Pacific U.S.A. Conservation measures of American pattern are prescribed for the region and a land classification plan for a catchment in the Yalova district, which includes conservation measures for forest land. Shelterbelt species are listed.

2446. RICHTER, H. Das forsttechnische System der Wildbach- und Lawinenverbauung. **[The control of torrents and avalanches by technical forestry measures.]** *Forstarchiv* 26 (11), 1955 (251–8). 16 refs. [G.g.]

Technical and biological methods of control are discussed; the reforestation of 80,000 ha. of infertile pasture land in Austria is planned as a preventive measures against avalanches and torrents.

2447. CURRIE, D. M. **Report to the Government of Pakistan on desert areas of West Pakistan.** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 564, 1956. pp. 29 + 6 photos.

The terms of reference of this inquiry were 'to make a survey of all studies made on desert research in West Pakistan and prepare a co-ordinated programme of desert control in the area'.

14. Systematic Zoology

145.7. Insecta. Entomology

See also Nos. 3058 *et seq.*, 3453 *et seq.*

2448. SNYDER, T. E. **Annotated,subject-heading bibliography of termites 1350 B.C. to A.D. 1954.** *Publ. Smithson. Inst.* No. 4258, 1956. pp. iii + 305.

2449. HINCKS, W. D. **Handbooks for the identification of British insects. Vol. I, part 5. Dermaptera and Orthoptera.** Royal Entomological Society of London. 1956. pp. 24. 14 refs. Price 6*s.*

2450. FRASER, F. C. **Handbooks for the identification of British insects. Vol. I, part 10. Odonata.** Royal Entomological Society of London. 1956. pp. 48. 26 refs. Price 10*s.*

2451. CROWSON, R. A. **Handbooks for the identification of British insects. Vol. IV, Part 1. Coleoptera: introduction and keys to families.** Royal Entomological Society of London. 1956. pp. 59. Price 10*s.* 6*d.*

2452. BRITTON, E. B. **Handbooks for the identification of British insects. Vol. V, Part II. Coleoptera, Scarabaeoidea (Lucanidae, Trogidae, Geotrupidae, Scarabaeidae).** Royal Entomological Society of London. 1956. pp. 29. 11 refs. Price 7*s.* 6*d.*

2453. RICHARDS, O. W. **Handbooks for the identification of British insects. Vol. VI, Part 1. Hymenoptera: introduction and key to families.** Royal Entomological Society of London. 1956. pp. 94. 71 refs. Price £1.

2454. OLDROYD, H. **Handbooks for the identification of British insects. Vol. IX, Part 1. Diptera. 1. Introduction and key to families.** Royal Entomological Society of London. 1954. pp. 49. 32 refs. Price 7*s.* 6*d.*

2455. MARSHALL, G. A. K. **Notes on the Campyloscelinae (Coleoptera, Curculionidae).** *Rev. Zool. Bot. Afr.* 44 (3/4), 1956 (224–40). [E.]

Describes and gives keys for 12 genera in this continental African subfamily, describes 6 species and distinguishes one new genus; for some species long lists of food plants, mainly rain-forest trees, are given.

2456. CHARARAS, C. Anatomie et biologie des coléoptères curculionides xylophages comparées à celles des coléoptères scolytides. **[Comparison of the anatomy and biology of wood-eating curculionids and scolytids.]** *Rev. Path. vég.* 35 (3), 1956 (113–213). 118 refs. [F.] I.M.I.

A profusely illustrated account of the anatomy of the Cossonini (*Rhyncolus porcatus*, *R. elongatus*, *Pentarthrum huttoni*, and *Caulotrupis aeneopiceus*) and of the Scolytini (*Scolytus scolytus*, *Phloeosinus bicolor*, *Xylechinus pilosus*, *Pityogenes chalcographus*, *Ips typographus* and *Leperesinus fraxini*). Some

species of the two tribes bear great external resemblance, suggesting to systematists an intermediate position for the Cossonini. Life history, symbiosis with bacteria, and parasitic diseases (bacteria and nematodes) are covered.

2457. REICHENBACH-KLINKE, H.-H. Der Verdauungstraktus des Parkettkäfers *Lyctus linearis* Goeze (Coleoptera, Lyctidae). [**The digestive system of *L. linearis*.**] *Z. angew. Ent.* 39 (4), 1956 (474–80). 14 refs. [G.g.e.] I.I.E.

2458. MILNE, A., and LAUGHLIN, R.; MILNE, A.; LAUGHLIN, R. **Biology and ecology of the garden chafer, *Phyllopertha horticola* (L.). I. The adult and egg production. II. The cycle from egg to adult in the field. III. The growth of the larva.** *Bull. ent. Res.* 47 (1), 1956 (7–22; 23–43); 48 (1), 1957 (127–54). 19 refs.

15. Animal Ecology. Game and Fish Management, Hunting, Shooting and Fishing

See also Nos. 2443, 2739, 2974, 3047, 3050–4, 3068.

2459. MARTIN, N. D. **An analysis of bird populations in relation to plant succession in Algonquin Park, Ontario.** *Abstr. of thesis*, in *Dissert. Abstr.* 16 (5), 1956 (1021–2). O.R.S.

Stages in vegetational succession in the hydrosere and the xerosere are discussed. Not all stages contained a distinct bird community but recognizable communities inhabited bog, boreal forest (*Abies balsamea*/*Picea glauca*), *Tsuga canadensis* forest and deciduous forest (*Acer saccharum*/*Betula lutea*), with respectively 13, 32, 28 and 18 species of territorial males.

2460. FRANK, H. Die Myxomatose in Nordrhein-Westfalen. [**The spread of myxomatosis in Nordrhein-Westfalen.**] *Forsch. u. Berat.* (*Forstw.*) *Landesaussch. landw. Forsch. Landes Nordrhein-Westfalen* No. 2, 1956 (156–8). [G.]

Describes the development of the epidemic from 7 centres of infection in 1953, during 1954 and 1955, chiefly in low-lying districts infested by midges of the genus *Aedes*.

2461. MILLER, H. A. **Opportunities in wildlife. Parts I & II.** *For. Fmr.* 16 (3), 1956 (10–2, 16); 16 (4), 1957 (10–1, 17–8).

[I.] The following forest types are regarded as suitable for wildlife management: Loblolly/Shortleaf Pine, Oak/Hickory, Oak/Gum/Cypress, Longleaf/Slash Pine, Oak/Pine and Appalachian hardwoods. [II.] Considers the various forms of wildlife associated with the 6 forest types, with particular reference to deer, wild turkey, squirrel, grouse and quail.

2462. VINCENT, P. Y.; RIEBOLD, R. J. **Conservation of timber—and game. Wildlife and timber, too, on the Francis Marion National Forest.** *Sth. Lumberm.* 193 (2417—Christmas No.), 1956 (252–4; 256–8).

The first of these articles deals generally with the problems of managing for both purposes, giving guiding rules for the number of food and 'den' trees [lairs] to be left per acre on game reserves and less intensely stocked areas when doing timber stand improvement cuttings. The second describes the management of a South Carolina national forest and wildlife preserve, chiefly Loblolly Pine. The beneficial effects (for both aims) of prescribed burning, involving a change-over from a selection to a shelterwood system, and the provision of food patches, mainly as strips along forest roads, are discussed.

2463. KREFTING, L. W., HANSEN, H. L., and STENLUND, M. H. **Stimulating regrowth of Mountain Maple for deer browse by herbicides, cutting and fire.** *J. Wildlife Mgmt.* 20 (4), 1956 (434–41). 4 refs. B.A.P.

Breast-height spraying with 2,4-D proved the most effective method of stimulating regrowth of *Acer spicatum* that had grown out of the reach of browsing deer. [Cf. *F.A.* 17 (No. 109).]

16. General Botany

160. Plant Chemistry

See also Nos. 2412, 2430, 2476, 2528–9, 2534, 2577, 2582–3, 2871, 2961–3, 3036, 3045, 3053, 3315 *et seq.*, 3513 *et seq.*

2464. PARKER, J. **Variation in copper, boron, and manganese in leaves of *Pinus ponderosa*.** *For. Sci.* 2 (3), 1956 (190–8). 37 refs.

The amounts of these elements varied widely. The means in p.p.m. (dry weight) were 5·4, 60·2 and 56·8 for Cu, B, and Mn, respectively. Significant differences were strongly suggested between trees, and less strongly between sites (8 locations in Idaho and adjacent Montana), but in neither case proved. Between branches of the same tree, differences far exceeded the limits of experimental error. No deficiencies or peculiar accumulations were found. More than 12 other metals were detected. Other work in this field and some of its results are reviewed and tabulated.

2465. OHTANI, M. **Pectins and crude fibres in the pollen grains of trees.** *Scientific Reports of the Saikyo University* (*Agriculture*), *Kyoto* No. 7, 1955 (21–5). 10 refs. [E.e.]

Pectin was extracted from 15 species (*Abies* spp., *Picea jezoensis*, *Pinus* spp., *Cunninghamia* spp., *Thujopsis dolabrata*, *Betula mandshurica* var. *japonica*, *Alnus pendula* and *Fraxinus chinensis* var. *rhynchophylla*) in larger quantities when extracted with hot water than with NH_4 oxalate. When the latter was used, larger amounts of pectin were extracted from deciduous than from coniferous pollen. The thicker parts of the pollen membranes appeared to contain more pectin than the thinner parts. Pollen of *Abies mariesii*, *Picea jezoensis*, *Pinus thunbergii*, *P. koraiensis*, and *P. caribaea* contained 36–48% crude fibre and that of *Cunninghamia* sp. ca. 10%. The role of the crude fibres and pectins is briefly discussed.

2466. KRUGMAN, S. **The anthocyanin and leucoanthocyanins of Sugar Pine seedlings.** *For. Sci.* 2 (4), 1956 (273–80). 31 refs.

In embryos and young seedlings of *Pinus lambertiana* the anthocyanin is malvin and the

leuco-anthocyanins yielded cyanidin and delphinidin. The evidence suggests that leuco-anthocyanins are not direct precursors of the anthocyanins. The presence and distribution of anthocyanin is not stable, the pigment shifting during development from the hypocotyl to cotyledons, whence it disappears 30–70 days after germination.

2467. ROUX, D. G. **Identification of anthocyanidins, leuco-anthocyanins and 2 : 3-dihydroflavonols in plant tissues.** *Nature, Lond.* 179 (4554), 1957 (305–6). 16 refs.

The material used included *Acacia melanoxylon*, *Grevillea robusta*, and *Schinopsis lorentzii*.

2468. HILLIS, W. E., and SWAIN, T. **Influence of illumination on the synthesis of leuco-anthocyanins in leaves.** *Nature, Lond.* 179 (4559), 1957 (586–7). 3 refs.

It was recently suggested [cf. *F.A.* 16 No. 861] that the controlling factor in lignification in *Fraxinus excelsior* is the illumination received by the leaves; it has also been shown [cf. *F.A.* 18 No. 933] that leuco-anthocyanins are possible precursors of heartwood extractives in *Eucalyptus* spp., in which their concentration in leaves varies throughout the season. It has now been shown that the synthesis of leuco-anthocyanins in the leaves of *Prunus domestica* var. Victoria is markedly affected by illumination; leaves from the shady side of a tree were found to have a markedly lower content of anthocyanins and also a definite though slighter inferiority in total phenols, than those on the sunny side. This dependence of leuco-anthocyanin synthesis on illumination is paralleled by lignin formation in the stone (endocarp) of the fruit; stones from the shady side showed a slower hardening, judged by ease of dissection, than those from the sunny side. It is felt that these experiments point to a correspondence between lignification and formation of leuco-anthocyanins that may lead to a better understanding of the metabolism and biosynthesis of the aromatic compounds in woody species.

2469. NARAYANA, C. S., and RANGASWAMI, S. **Isolation of three crystalline substances from the seeds of *Cassia tora* Linn.** *Curr. Sci.* 25 (11), 1956 (359). 2 refs. A.P.B.

2470. TOPPS, J. H., and WAIN, R. L. **Fungistatic properties of leaf exudates.** *Nature, Lond.* 179 (4561), 1957 (652–3). 3 refs.

Washings of leaves of Ash, Beech, Chestnut, Elder, False Acacia, Hazel, Horse Chestnut, Laburnum, Oak, Plane, Privet and Sycamore Maple collected in Oct. 1953, and June 1954 and 1955, were extracted with ether and examined for their effect on germination of spores of *Botrytis cinerea*. Most extracts showed a significant degree of fungistatic activity. With all species except Laburnum and Sycamore Maple, the extension of the conidial germ tubes was retarded, and with Hazel and Chestnut a thickening of the germ tube occurred. The most fungistatic extracts were from Elder and Privet. In 1955, Yew and Ivy were included; leaf washings of the latter showed significant potency.

161. Physiology

See also Nos. 2415, 2437, 2440, 2484, 2487, 2575 *et seq.*, 2688, 2982.

2471. KOZLOWSKI, T. T. **Tree physiology bibliography.** [The Author, University of Massachusetts, Amherst, Mass.] 1956. pp. 316. Limited distribution.

Gives between 3500 and 4000 literature references, divided under the following heads: carbohydrate metabolism, dormancy, growth of stems, growth of roots, lipids, mineral nutrition, N metabolism, photosynthesis, respiration, translocation, and water relations.

2472. FRASER, D. A. **The translocation of minerals in trees.** *Tech. Note For. Br. Can.* No. 47, 1956. pp. 16. 26 refs.

Reviews the literature and includes some data from experiments in progress at Petawawa.

2473. KOCH, W. Der Tagesgang der 'Produktivität der Transpiration'. **[The daily course of 'transpiration productivity'.]** *Planta* 48 (4), 1957 (418–52). 25 refs. [G.g.] O.B.D.

This study of the relationship between transpiration and dry-matter production of field crops, included also investigations of needles of Spruce and Silver Fir suffering from SO_2 damage, in which a marked increase in 'transpiration productivity' was noted.

2474. ZIEGLER, H. Über den Gaswechsel verholzter Achsen. **[Gas exchange in lignified axial portions of plants.]** *Flora, Jena* 144 (2), 1956 (229–50). 27 refs. [G.g.] O.B.D.

Investigations of CO_2 loss were made on sound specimens cut from the stem, branches and twigs of 9 standing deciduous and coniferous species, and also on specimens of *Acer platanoides* roots. When the wood of stem and root is in direct contact with the air, CO_2 emission is at its maximum, even when there is no diffusion of gas through the bark. If gas exchange can take place only through the bark, the intensity of CO_2 emission is always reduced, the degree differing with species. The lenticels are involved in gas exchange through the bark, but again to a different degree in different species. Specimens in which gas exchange can take place only through the bark had, on the whole, higher respiratory quotients than those where part of the wood was exposed. This increase in the respiratory quotient goes parallel with the resistance to diffusion of the bark. The findings show that in the parts of the tree examined, fermentation processes take place that can attain a considerable degree of intensity in specimens with thick bark and a consequent resistance to diffusion of gases. These fermentation processes are conditioned by lack of O.

2475. WASSINK, E. C., RICHARDSON, S. D., and PIETERS, G. A. **Photosynthetic adaptation to light intensity of leaves of *Acer pseudoplatanus*.** *Acta bot. neerland.* 5 (3), 1956 (247–56). 15 refs. O.B.D.

Preliminary experiments on light-adaptation phenomena in *A. pseudoplatanus* are described. First-year seedlings were grown under 4 different light intensities. The dependence of photosynthesis

on light intensity, and the relationship between light intensity and both chlorophyll content and protein content were measured in single leaves. The results show that: (1) with increasing light intensity the saturation light intensity as well as the maximum rate of photosynthesis increases; (2) the chlorophyll content/sq. cm. decreases with increasing light intensity; (3) within each light intensity class, the maximum rate of photosynthesis seems to be directly correlated with the chlorophyll content; and (4) in strong light the leaves become thicker but without a conspicuous increase in protein content.

2476. SUHOV, G. V. Predvariteljnye rezuljtaty issledovanija biosinteza živicy pri pomošči radioaktivnogo ugleroda. **[Preliminary results of an investigation of resin biosynthesis by means of radioactive carbon.]** *Gidrol. lesohim. Prom.* 9 (4), 1956 (17). [Russ.] P.R.

Results of experiments in which CO_2 labelled with C^{14} was assimilated by 10- to 12-year-old Scots Pine showed that the specific radioactivity of resin first increased steadily, attained a maximum value after a few days, and then fell. Study of the activity curves showed that resin forms continuously in the tree, irrespective of tapping; the amount of resin removed by tapping seems to be a very small proportion of the amount formed by the tree within the same time. Most of the resin is presumably transformed into other substances within the tree.

162. Pathology and Teratology

2477. FERGUS, C. L. **An unusual cone fasciculation of Table Mountain Pine [*Pinus pungens*].** *Plant Dis. Reptr.* 40 (8), 1956 (752–4). 2 refs. A.P.B.

Presents photographs and a brief description of a fasciculation bearing ca. 100 cones, spirally arranged.

163. Embryology

2478. ECHOLS, R. M. **Microsporogenesis and megasporogenesis in *Tsuga canadensis*.** *Proc. 3rd Ntheast For. Tree Improvemt. Conf., Ithaca 1955*, 1956 (31–2).

2479. RADFORTH, N. W., and PEGORARO, L. C. **Assessment of early differentiation in *Pinus* proembryos transplanted to *in vitro* conditions.** *Transactions of the Royal Society of Canada, Ottawa (Sect. 5, Ser. 3)* 49, 1955 (69–82) 15 refs. A.P.B.

Describes experimental techniques, effect of culture media etc. in work with proembryos of *Pinus nigra* var. *austriaca*. Results indicate that chemical and physical factors influence the expression of inherited potentialities. Development appeared not to be controlled entirely by phylogenetic factors, radial or three-dimensional growth rather than filamentous organization being frequently observed.

2480. JOHRI, B. M., and VASIL, I. K. **The embryology of *Ehretia laevis* Roxb.** *Phytomorphology* 6 (2), 1956 (134–43). 16 refs. O.B.D.

164. Morphology

See also No. 2542.

2481. SEELIGER, I. Über die Kultur isolierter Wurzeln der Robinie (*Robinia pseudoacacia* L.). **[The culture of isolated roots of *R. pseudoacacia*.]** *Flora, Jena* 144 (1), 1956 (47–83). Many refs. [G.g.] O.B.D.

2482. ZIEGLER, H. Frühjahrsblutungssaft als Nährboden für die Kultur isolierter Wurzeln. **[Spring sap as a nutrient medium for the cultivation of excised roots.]** *Planta* 48 (2), 1956 (190–9). 8 refs. [G.g.] O.B.D.

Sap of *Acer platanoides*, *A. pseudoplatanus*, *Alnus glutinosa*, *Betula verrucosa*, *B. pubescens*, *Carpinus betulus* and *Juglans regia* proved suitable media on which to grow excised roots of *Zea mays* and *Robinia pseudoacacia* over a period of 14 days. Roots of *A. platanoides* and *B. pubescens* were also grown in sap from their own species over the same period. In short-term (24-hour) experiments, however, only in sap of *J. regia* did maize roots equal the growth made in synthetic culture media with a corresponding sugar content. The nature of the retarding influence of the sap of the other species is discussed.

2483. PIZZOLONGO, P. Osservazioni sullo sviluppo della gemma intrapeziolare di *Platanus orientalis* L. **[The development of axillary buds in *P. orientalis*.]** *Annali di Botanica, Roma* 24 (2), 1953 (340–6 + 12 photos). 12 refs. [It.it.e.] E.B.

2484. MILTHORPE, F. L. [Editor.] **The growth of leaves: proceedings of the Third Easter School in Agricultural Science, University of Nottingham, 1956.** Butterworths Scientific Publications, London. 1956. pp. x + 223 + 6 plates. Many refs. Price £2.

Includes the following papers: General aspects of leaf growth (*F. G. Gregory*); General processes of differentiation (*E. Bünning*); Growth and cellular differentiation (*J. K. Heyes* and *R. Brown*); The inception of leaf primordia (*C. W. Wardlaw*); Spatial and temporal correlations involved in leaf-pattern production at the apex (*F. J. Richards*); Morphological aspects of leaf expansion, especially in relation to changes in leaf form (*H. Jones*); Growth of leaves of an Apple rootstock (*H. W. B. Barlow* and *C. R. Hancock*); Leaf growth under constant conditions and as influenced by light-dark cycles (*E. Bünning*); Etiolation phenomena and leaf expansion (*W. T. Williams*); The relative importance of the different stages of leaf growth in determining the resultant area (*F. L. Milthorpe*); Influence of light and temperature on leaf growth (*G. E. Blackman*); Some methods of measuring leaf area (*E. J. Winter, et al.*); A method for rapid determination of leaf area in the field (*G. H. Freeman* and *B. D. Boles*); A photometer for estimating the area of detached leaves (*D. H. Maggs*); A simplified photoelectric cell method for measuring leaf area (*D. Aspinall, et al.*); A new form of contact auxanometer suitable for recording the extension growth of leaves (*D. B. Idle*); Equipment for micro-meteorology (*H. L. Penman* and *I. Long*); Regeneration of plants from leaves (*M. E. Marston*); Stem apices and the inception of leaf primordia (*C. W. Wardlaw* and *E. G. Cutter*).

2485. NAIR, N. C., and BAHL, P. N. **Vascular anatomy of the flower of *Myristica malabarica* Lamk.** *Phytomorphology* 6 (2), 1956 (127–34). 23 refs. O.B.D.

2486. LAKHANPAL, R. N., and NAIR, P. K. K. **Some abnormal pollen grains of *Picea smithiana* Boiss.** *J. Indian bot. Soc.* 35 (4), 1956 (426–8 + 1 plate). 9 refs. O.B.D.

Abnormal grains with 1, 3 or 4 air-sacs were found in specimens of *P. smithiana* [*P. morinda*] collected in Kashmir.

2487. **Stomata and stomatal movement [in *Elaeis guineensis*].** *Rep. W. Afr. Inst. Oil Palm Res. 1955/56*, 1956 (102–3).

Oil Palm stomata are confined to the abaxial leaf surface, and the guard cells are orientated parallel to the long axis of the leaflet, at a mean density of 146/sq. mm.; they are semi-xeromorphic in structure. The infiltration method of Molisch has been successfully adapted for the measurement of stomatal aperture on Oil Palm leaflets, and a study was made of leaves on 3-year-old Palms. When aperture was plotted against time, the curves obtained for January and February readings were very similar: a sharp opening at dawn is followed by a partial closure during the midday period; this is followed by a further slight opening before closure at dusk. The midday closure is a wilting effect consequent upon total radiation occurring during this time. In March, when the soil was wetter after 4 in. of rain, only a slight midday closure was recorded. The patterns of opening and closing for each position on the Palm were very similar. The mean % opening for 24 hours decreases slightly from base to tip of leaf, and stomata open more widely on older than on younger leaves. No appreciable difference was observed between leaves on the north and on the south side of trees.

165. Phylogeny, Evolution. Heredity, Genetics and Breeding: Variation

See also Nos. 2396, 2531–4, 2548–9, 2608, 2616, 2618–9, 2720–7, 2740–2, 3015, 3046.

2488. **[Improvement of forest trees in Czechoslovakia.]** *Sborn. čsl. Akad. zeměd. (Lesn.)* 29 (7/8), 1956 (451–614 + 2 tbls.). Many refs. [Cz. or Slovak., cz., russ., g., or e.]

This double issue includes the following ten papers presented at the March, 1956, meeting (Brno) of the Forest Biology Committee of the Forestry Section of the Czechoslovak Academy of Agricultural Sciences: (1) Improvement of forest trees (*G. Vincent*) [e.*e.*]; (2) Improvement of forest trees from the standpoint of Czechoslovak forest practice (*J. Šindelář* [g.*g.*]; (3) Importance of the need for tending and improvement work in the floodland forests of Slovakia (*M. Vojtuš*) [g.*g.*]; (4) Improvement of *Populus tremula* (*J. Pospíšil*) [g.*g.*]; (5) A contribution to the hybridization of *Betula* spp. (*J. Kantor*) [e.g.*e.g.*]; (6) Effect of artificial pollination of Birch on seed quality (*E. Václav*) [g.*g.*]; (7) Improvement of Elms by crossing (*B. Richter*) [g.*g.*]; (8) The crossing of *Juglans* spp. (*Z. Zavadil*) [g.*g.*]; (9) Possibilities of raising Eucalypts in the climatic conditions of Czechoslovakia (*V. Dušek*), [g.*g.*], and (10) Present status and problems of *Pinus sylvestris* improvement in Czechoslovakia (*K. Kaňák*). Article (3) is in Slovak, all others in Czech; each article has a Russian summary and Russian captions in addition to the other summaries indicated.

2489. HAGMAN, M. Selostus säätiön käytännöllisestä toiminnasta vuonna 1955. **[Report on the practical work of the Foundation [for Forest Tree Breeding] in 1955.]** *Medd. Stift. Rasförädl. Skogsträd, Helsinki* No. 2, 1956. pp. 31. [Fi.Sw.]

The report discusses briefly the work of the year, including that of listing plus trees and stands, stands of foreign provenance etc., grafting, clone research, hybridization, and seed collection.

2490. SCHMUCKER, T. Forstgenetik: einige Befunde am Rande. **[Forest genetics: some marginal discoveries.]** *Forstwiss. Cbl.* 75 (1/2), 1956 (32–41). 15 refs. [G.]

Reports and discusses some unrelated discoveries made by the Forestry Faculty at Göttingen University in the course of their experiments, viz.: the inheritance of seed size in Beech; rooting of large cuttings for growing timber trees; grafting early- and late-flushing strains of Beech and Spruce; inheritance of spiral grain in Spruce, in which experiments with the translocation of dyes in young Spruce stems showed that spiral grain is the rule rather than the exception in young Spruce trees and is therefore more likely to be due to inherent factors than to external ones; and grafts between different species and genera.

2491. ZABEL, R. A. **Decay resistance variations within Northeastern forest tree species. [With discussion.]** *Proc. 3rd Ntheast. For. Tree Improvemt. Conf., Ithaca 1955*, 1956 (13–7). 8 refs.

Briefly reviews the literature and describes work in progress at N.Y. State University College of Forestry.

2492. BOUDRU, M. Races et écotypes chez le mélèze du Japon. **[Races and ecotypes in Japanese Larch.]** *Bull. Soc. for. Belg.* 64 (3), 1957 (161–9). [F.]

Recognizes two main ecotypes: that from low altitudes, usually defective in stem form, but with well developed crowns and few really bad individuals; and that of high (1600–2000 m.) altitudes, with straight, well formed stems, but variable in crown form and branchiness and with a high % of abnormal individuals.

2493. VINCENT, G. Hospodářské hodnocení odrůd a forem některých druhů lesních dřevin. **[The economic evaluation of the varieties and forms of forest species.]** *Sborn. čsl. Akad. zeměd. (Lesn.)* 29 (4), 1956 (233–56). 61 refs. [Cz.cz.russ.e.g.*russ.e.g.*]

Analyses the results of Czechoslovakian and other (Scandinavian, German Swiss, Russian) investigations (both laboratory and plantation) dealing with the exact identification of the varieties and forms involved, i.e. their characteristic features and distinguishing criteria. Two forms of *Picea abies* (high-mountain, and mountain) and 3 forms of

Pinus sylvestris (mountain, hill, and lowland) encountered in Czechoslovakia are described, illustrated and discussed in detail. It is recommended that no forest species proper to one or other of the following four climatic zones should be planted elsewhere in Czechoslovakia: (1) high-mountain regions, growth period (g.p.) < 100 days; (2) mountain region, g.p. 100–129 days; (3) lower hills, not forming continuous ranges, g.p. 130–165 days, and (4) lowlands and hilly regions, g.p. > 165 days.

2494. RUBNER, K. Über Kiefernrassen, insbesondere die nordostbayerische Höhenkiefer. **[Scots Pine races, with particular reference to the N.E. Bavarian Pine of the uplands.]** *Forstarchiv* 28 (1), 1957 (1–8). 20 refs. [G.g.]

Outlines briefly the difficulties of making clear distinctions between the races of Scots Pine in S. Germany. A description is given of the morphological features, origin, distribution and associated species of the upland Pine of N.E. Bavaria. This ecotype is silviculturally valuable because it can compete with Spruce at high altitudes, as in the central mountains of Germany, and so improve soil conditions and resistance to storm on the Spruce sites. It will also give good yields on poor soils and sunny slopes where Spruce can not. It is tolerant to shade and natural regeneration is easy.

2495. BALDWIN, H. I. **Winter foliage colour of Scotch Pine.** *Proc. 3rd Ntheast. For. Tree Improvemt. Conf., Ithaca 1955*, 1956 (23–8).

A study was made of the winter foliage of 17-year Scots Pine of different provenances at Fox Forest, New Hampshire—a question of some commercial interest because of the use of this species for Christmas trees. (1) Foliage of trees raised from seed of extreme northern (Scandinavian) provenance turned bright yellow at the approach of winter; this is characteristic of sources away from the sea coast and at high altitudes N. of 60° lat. These trees are purple to green at the seedling stage. (2) Continental sources in Scandinavia, N. Germany, and E. Europe turned a pale yellow in winter. (3) Coastal sources from the Baltic and the Atlantic coasts and mountainous regions inland commonly retained their blue-green colour throughout the winter; they were purple in the seedling stage. (4) S. European and some coastal sources retained a deep green colour. There are many local exceptions and variations that can be explained only by a detailed study of the climate and other site factors of the place where the seed was collected.

2496. BOLLAND, G. Resistenzuntersuchungen vor allem über Kienzopf und Schütte an der Kiefer. **[Resistance of Scots Pine to *Peridermium pini* and *Lophodermium pinastri*.]** *Züchter* 27 (1), 1957 (38–47). 78 refs. [G.g.] E.M.B.

Research, mainly European, on resistance is discussed, and experiments by the author are described; full details with statistical analysis of the results will be published elsewhere. Plants (1–6 years) were successfully infected with *P. pini* by injections into the May and June shoots of the current year, and with *L. pinastri* by spreading fallen needles from heavily infected plantations thickly under the plants. These methods give an early indication of the resistance to be expected from selected progeny.

2497. ZOBEL, B. **Geographic range and intraspecific variation of Coulter Pine.** *Madroño, Berkeley, Calif.* 12 (1), 1953 (1–7). 8 refs. K.

Characters studied (cones, foliage, seeds, and oleoresins) on trees from 9 isolated, ecologically diverse sites, were fairly constant, though a tendency towards the initiation of geographic races was noticeable in some populations. Habit varied and there were some well shaped, small-limbed forms.

2498. DILLON, E. S., and ZOBEL, B. V. **A simple test for viability of Pine pollen.** *J. For.* 55 (1), 1957 (31–2). 8 refs.

In a method used currently by the Texas Forest Service, 2-3 c.c. of distilled water or sucrose medium are placed in a screw-cap vial (8 × 15 in.); a little pollen is dropped into the solution, and the vial is shaken, capped, and set in a constant-temperature oven at 26–27° C. for 72 hours. As this is about room temperature, the method may be used without such an oven. Several times during the 72 hours the vial is shaken slightly to redistribute settling pollen grains, and finally it is thoroughly shaken, and drops of the solution are examined under a microscope. A count is then taken of germinated grains having the tube as long as the pollen grain. Tests were also carried out on pollen of 6 species of Pine from 13 different sources to determine the most suitable media; those tested were distilled water, and 3%, 5% and 10% sucrose solutions. In each case germination % was higher in the distilled water, and the pollen grains had longer tubes and fewer noticeable starch grains than those in a sucrose medium.

2499. ECHOLS, R. M., and MERGEN, F. **Germination of Slash Pine [*P. elliottii*] pollen *in vitro*.** *For. Sci.* 2 (4), 1956 (321–7). 14 refs.

Gives the germination %s obtained with 38 media in various strengths. Chelated iron at 5–50 p.p.m. showed the highest (96%) followed by 10% sucrose and distilled water with 90 and 76% respectively. Auxins were completely inhibiting to slightly stimulating, according to strength. Aqueous extracts of ♀ flowers were inhibiting. Pollen stored at 4° C. and 30% relative humidity dropped 16% in viability in 52 days.

2500. SCHMIDT, W. Kreuzungsversuche zur Erzielung von Kiefernhybriden. **[Experiments in breeding Pine hybrids.]** *Forsch. u. Berat. (Forstw.) Landesaussch. landw. Forsch. Landes Nordrhein-Westfalen* No. 2, 1956 (134–47). [G.]

Pollen from 12 exotic Pine species was used to fertilize 40 flowers on each of 50 *Pinus sylvestris* mother trees per species, i.e. 24,000 pollinations in all. For ease of operation, the work was done chiefly in Westphalian farm woodlands where the trees were of bushy growth, presumably not because of bad heredity but as a result of early browsing by sheep. A high proportion of successful crosses was obtained with *P. patula* and *P. nigra* var. *austriaca*, and isolated ones with *P. radiata*, *P. palustris* and *P. pinaster*. At 2 years of age, *P. pinaster*, *P. palustris* and *P. patula* hybrids were superior to the pure-bred

progeny of their mothers. All hybrids survived the hard winter of 1954–55, whereas pure *P. radiata* and *P. patula* died. Methods of early testing for a number of characters are discussed.

2501. **Breeding blister-rust-resistant White Pine of good growth and quality.** *Rep. Intermt. For. Range Exp. Sta. 1955* [1956] (2–4).

Techniques of inducing early flowering are discussed. Tests showed tendencies for heavier seed to be produced (*a*) on shoots in the upper and outer crown and on the S. or W. sides, (*b*) on shoots with larger numbers of cones, and (*c*) in cones with relatively fewer sound seeds in relation to cone length. Certain pollens were associated with relatively narrow and other with relatively wide cone scales, apparently a result of the effect of the pollen on maternal tissues of the fruit. Osmotic pressure of seeds from 123 seed lots was assessed from their readiness to germinate in sugar solution; a moderate inverse correlation of osmotic pressure with growth rate of progenies was found.

2502. HEIMBURGER, C. **Blister rust resistance in White Pine. [With discussion.]** *Proc. 3rd Ntheast. For. Tree Improvement. Conf., Ithaca 1955*, 1956 (6–13).

Describes the work so far done by the Ontario Department of Lands and Forests. The data show that *Pinus strobus* seedlings are probably more susceptible to blister rust than grafts; *P. monticola* grafts are more susceptible than *P. strobus* grafts, but *P. monticola* seedlings less so than *P. strobus* seedlings; *P. peuce* grafts and seedlings are significantly more resistant than the other species.

2503. ORR-EWING, A. L. **Controlled pollination techniques for the Douglas Fir.** *For. Sci.* 2 (4), 1956 (251–7). 5 refs.

Cones isolated in viscose casings in March–April are pollinated in April when the ovulate scales are fully extended. The pollen, previously collected and stored in humid air at 4° C., is blown in through a hole pierced by a hypodermic syringe fitted with a rubber ball and pollen agitator. When the seed-scales close (April–May) larger kraft-paper bags are substituted for the completion of cone development. Pollen stored in a dry flask at 4° shows a steady deterioration and even when, in the second year, the germination % may show no loss (bacto-agar culture), the fertilizing potential as shown by the number of viable seed produced may undergo very drastic reduction.

2504. GALOUX, A. Le sapin de Douglas et la phytogéographie. **[Douglas Fir and phytogeography.]** *Trav. Sta. Rech. Groenendaal* (*Sér. B*) No. 20, 1956. pp. 131 + 1 tbl. 102 refs. [F.]

An expansion of a paper already published, with data from Belgian provenance trials, a bibliography, etc. [Cf. *F.A.* 18 No. 116.]

2505. SCHOLZ, E. Röntgenmutationen bei Birke. **[X-ray-induced mutations in Birch.]** *Züchter* 27 (1), 1957 (54–60). 24 refs. [G.g.] E.M.B.

A full version of a paper already published in abstract form. [See *F.A.* 18 No. 117.]

2506. WOLLERMAN, E. H. **Strains of Black Locust resistant to borers [*Cyllene robiniae*].** *Proc. 3rd Ntheast. For. Tree Improvemt. Conf., Ithaca 1955*, 1956 (35–8).

Preliminary results of trials in progress in Ohio, with discussion.

2507. PRYOR, L. D., CHATTAWAY, M. M., and KLOOT, N. H. **The inheritance of wood and bark characters in *Eucalyptus*.** *Repr.* from *Aust. J. Bot.* 4 (3), 1956 (216–39 + 3 plates). 15 refs.

Two series of hybrids were examined in relation to the parents: (1) derived from the combination *E. robertsoni* × *E. rossii* of the group Renantherae, and (2) from *E. elaeophora* × *E. maculosa* of the group Macrantherae-Normales. The hybrids and parents were assessed according to various physical and mechanical properties of the wood, features of the bark structure, field characters, and measurements of characters in the progeny raised from each. The properties of the hybrids were found to be either not significantly different from those of either parent or intermediate between those of the parents. The degree to which they approached either parent in the various phenotypic characters examined was found, in the few cases where data were adequate, to be correlated closely with the genotype and likewise with its position in the range between the two parents. The graded sequence of variation in the characters of the different individuals in the hybrid combinations suggests that the characters examined are, in general, under multiple-factor control. It is likely that most Eucalypt hybrids are intermediate as a rule in their characters between the parents, and this applies to wood and bark characters as well as general morphological features. *From authors' summary.*

2508. GABRIEL, W. J. **Preliminary report on clonal differences in the wood and phloem of *Populus deltoides* and *P. trichocarpa*.** *Proc. 3rd Ntheast. For. Tree Improvemt. Conf., Ithaca 1955*, 1956 (33–4).

Data from individual trees indicated statistically significant differences in fibre length and sp. gr. between clones of the two species studied. Variations were also apparent in the fibre arrangement in the phloem. The material was from trees ⩽ 5 years old. Studies should be made on more mature trees to determine whether these juvenile traits are permanent or temporary.

2509. MEHRA, P. N., and KHOSHOO, T. N. **Cytology of conifers. I & II.** *Journal of Genetics, London & New York* 54 (1), 1956 (165–85 + 1 plate). 34 refs. O.B.D.

Chromosome analyses of material taken from (I) 41 spp. of the Abietaceae, Taxodiaceae and Cupressaceae, and (II) 4 species of *Podocarpus* and one species of *Cephalotaxus*.

2510. DARLINGTON, C. D., and WYLIE, A. P. **Chromosome atlas of flowering plants.** Allen & Unwin, London. 2nd ed. 1955. pp. xx + 519. 42 pp. of refs. Price 60*s*.

[Cf. *F.A.* 8 No. 2293.] The scope of this new edition has been extended to include all flowering

plants, and therefore includes many more tree species than the original *Chromosome atlas of cultivated plants*.

168. Histology

See also section 811 and Nos. 2481–5.

2511. RICCI, I. Costituzione chimica della parete delle cellule oleifere del *Laurus nobilis*. **[The chemical constitution of the walls of oil-bearing cells [in the leaves] of *L. nobilis*.]** *Annali di Botanica, Roma* 24 (2), 1953 (347–51). 4 refs. [It.e.] E.B.

The cell wall consists of 3 layers—an outer one of lignified cellulose stainable with Light Green, an intermediate one of suberin, and an inner one of cellulose.

17. Systematic Botany

172.8. Eumycetes (True Fungi)

See also Nos. 2994 *et seq.*

2512. IMAZEKI, R., and TOKI, S. **[Higher fungi of the Asakawa Experiment Forest II.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 87, 1956 (49–58). Many refs. [Jap.e.e.]

Lists 3 ascomycetes and 32 basidiomycetes (Agaricaceae 20, Clavariaceae 6, Russulaceae 4, and one each of Boletaceae and Polyporaceae.). Five species new to Japan (of the genera *Acanthocystis*, *Pluteus*, *Tricholoma* and *Russula*) are described.

2513. PURI, Y. N. **Studies on Indian *Poria*.** *J. Indian bot. Soc.* 35 (3), 1956 (277–83 + 1 plate). 15 refs. O.B.D.

Describes 5 species new to India.

2514. FERCHAU, H. A., and JOHNSON, T. W., JR. **Taxonomy of the *Cenangium* dieback fungus.** *For. Sci.* 2 (4), 1956 (281–5). 9 refs.

Tabulates for 72 collections, referable to *C. ferruginosum* and *C. atropurpureum*, from > 20 species of Pine and one each of Spruce, Fir, and Douglas Fir, the size of apothecia, ascus, and ascospore, and pigmentation, and discusses host range and the gregariousness or scatter of apothecia. It is concluded that *C. atropurpureum* is not a valid species and should be sunk as a variant of *C. ferruginosum*.

2515. FORD, D. H., and RAWLINS, T. E. **Improved cytochemical methods for differentiating *Cronartium ribicola* from *Cronartium occidentale* on *Ribes*.** *Phytopathology* 46 (12), 1956 (667–8). 4 refs.

The uredial and telial stages of these rusts (of *Pinus strobus* and *P. edulis* respectively) are morphologically indistinguishable. Two methods are developed for distinguishing the telia on *Ribes*. In the field method the telial columns are treated with acid fuchsin solution, buffered at pH 4·8; only in the telia of *C. occidentale*, does the buffer rapidly remove the red stain.

2516. JOHNSON, T. W. **Marine fungi. I. *Leptosphaeria* and *Pleospora*. II. Ascomycetes and deuteromycetes from submerged wood.** *Mycologia* 48 (4; 6), 1956 (495–505; 841–51). 26 refs. P.R.

(I) *Leptosphaeria discors*, *L. albopunctata*, *L. marina*, *L. maritima*, and *L. orae-maris* are marine species known to occur off the coast near Beaufort, N.C. *L. halima*, occurring on submerged wood and on culms of *Spartina alterniflora* is described as new. *L. incarcerata* and *L. spartinae* are considered synonymous with *L. albopunctata*. A new marine *Pleospora*, viz. *P. pelagica*, is described from culms of *S. alterniflora*. (II) Six deuteromycetes and 9 ascomycetes are reported from marine habitats. *Stemphylium maritimum*, *Massariella maritima*, and *Sphaerulina pedicellata* are new to science. Marine fungi reported, but not identifiable because of paucity of material, are tentatively recognized to be members of the genera *Hormiscium*, *Sphaerulina*, *Physalospora* and *Ceratosphaeria*. *Arenariomyces cinctus* Höhnk. is concluded to be synonymous with *Peritrichospora integra* Linder. A marine ascomycete forming cleistothecia is described but not named. *From author's summaries.*

2517. WILSON, I. M. **Some new marine Pyrenomycetes on wood or rope: *Halophiobolus* and *Lindra*.** *Trans. Brit. mycol. Soc.* 39 (4), 1956 (402–15 + 1 plate). 10 refs. O.B.D.

Describes 2 new species (*H. rufus* and *H. purpureus*) and *H. longirostris* recorded for the first time in Britain; also a new genus and species, *Lindra inflata*, found on a wood block near the lower part of the intertidal region at Aberystwyth.

174. Spermatophyta, Seed-Plants in General. Floras and Check-Lists

See also No. 2559.

2518. EDLIN, H. L., and NIMMO, M. **Treasury of trees.** Countrygoer Books Ltd., Manchester. 1956. pp. 311. 62 refs. Price £3. 15*s*.

Contains 158 plates made up of numerous photographs of some 100 species of trees (native and exotic) grown in Britain, with details of foliage, flowers, buds, seeds etc., accompanied by general notes on each species.

2519. LI, H.-L., and KENG, H. **Families and genera of Formosan plants. IV. Dicotyledons: Nymphaeaceae to Myristicaceae.** *Quart. J. Taiwan Mus.* 8 (4), 1955 (329–42). [E.] [Cf. *F.A.* 14 No. 109; 15 No. 105.]

2520. LE GALLO, C., and MONACHINO, J. **Additions to the flora of St. Barthelémy.** *Carib. For.* 17 (1/2), 1956 (12–24). 4 refs. [Cf. *F.A.* 3 p. 32.]

2521. COWAN, R. S. *et al.* **New species and new records of plants in Guiana [and N.E. Brazil].** *Brittonia* 8 (4), 1957 (231–45).

New tree species include *Guatteria microsperma*, *Siparuna emarginata*, *Quiina congesta*, *Faramea polytriadophora*, *Isertia pterantha*, *Ixora cowani*, *Palicourea chrysorrhachis* and *Rudgea dasyantha*; all but the first two are from the Guianas.

2522. MACBRIDE, J. F. **Flora of Peru.** *Botanical Series, Field Museum of Natural History, Chicago* 13 (Part 3A, No. 2), 1956 (291–744).

Sapindaceae to Theaceae. [Cf. *F.A.* 13 Nos. 989, 3641.]

2523. MOUNTFORD, C. P. **Australian tree portraits.** Melbourne University Press, Melbourne. 1956. pp. 69. Price 45*s*.

Full-page photographs of 30 tree species, accompanied by short notes and drawings of foliage, flowers and fruit.

174.2/.7. Gymnosperms

See also No. 2608.

2524. YATOH, K.-I. **Conifers of the Kii peninsula: 1–3.** *Reprs.* from *Bulletin of the Faculty of Agriculture, Mie University, Tsu* No. 11, 1955 (73–93); Nos. 12 & 13, 1956 (57–76; 123–32). 25 refs. [E.jap.]

Descriptions, notes on distribution with maps, and photographs and drawings illustrating needles, shoots, cones, habit of growth etc.

2525. BOWERS, N. A. **Cone-bearing trees of the Pacific Coast.** Pacific Books, Palo Alto, Calif. 1942 (1956). pp. xxxv + 169. Price $3·50.

A 5th printing of a popular manual for identification, first published in 1942. A short introduction to tree-ring analysis for purposes of dendrochronology has been prefixed to this issue.

2526. KÖSTLER, J. N. Abeti fra Scilla e Cariddi. **[Firs between Scylla and Charybdis.]** *Monti e Boschi* 8 (1), 1957 (38, 42–3). [It.]

An account of the few remaining trees of *Abies nebrodensis* which, up to 150–200 years ago, was the typical mountain species of northern Sicily.

2527. MACENKO, A. E. O vidovoĭ samostojateljnosti tjanjšanskoĭ pihty [*Abies semenovii*]. **[The independence of *A. semenovii* as a species.]** *Bot. Ž.* 41 (10), 1956 (1504–9). 25 refs. [Russ.]

From observations in the Chatkal Mts., and from herbarium specimens, it is concluded that *A. semenovii* differs specifically from *A. sibirica*. It is geographically isolated from *A. sibirica* and occurs in quite different vegetation types. Features considered are the length, breadth and anatomy of needles, the location of resin ducts, and the form of cone bracts and scales.

2528. MIROV, N. T. **Taxonomy and chemistry of the White Pines.** *Madroño, Berkeley, Calif.* 12 (3), 1953 (81–9). 25 refs. K.

The 26 species considered to be comprised in the section *Haploxylon* are discussed in the light of their turpentine chemistry, and a diagram of their relationship is presented.

2529. MIROV, N. T. **Apache Pine and its relationship to Ponderosa Pine.** *Madroño, Berkeley, Calif.* 12 (8), 1954 (251–2). 7 refs. K.

Discusses the taxonomy of Apache Pine and those characters, including biochemical ones, that lead the author to believe it to be a distinct species, *Pinus engelmannii*.

2530. JOHANSEN, D. A. **Morphological criteria for the specific validity of *Pinus jeffreyi*.** *Madroño, Berkeley, Calif.* 12 (3), 1953 (92–5). 11 refs. K.

An analysis of archegonial characters of *P. jeffreyi* and *P. ponderosa*, from which it is concluded that *P. jeffreyi* is a distinct species and that it is phylogenetically the older.

2531. RÖHRIG, E. Über die Schwarzkiefer (*Pinus nigra* Arnold) und ihre Formen. 1. Teil: Die natürlichen Standorte. **[*P. nigra* and its forms. Part I. Natural sites.]** *Silvae Genet.* 6 (1/2), 1957 (39–53). 179 refs. [G.g.e.f.]

Deals with the taxonomy of *P. nigra*, and its range and site characteristics in Spain, France (including Corsica), Italy, Austria and S.E. Europe. Some of the more important stands are described. Provenance trials in W. Germany will begin in spring 1957.

2532. MERENDI, A. Il pino di Villetta Barrea. **[The Villetta Barrea Pine.]** *Ital. agric.* 93 (12), 1956 (968–72). [It.] E.M.B.

Describes the habitat, morphology and silvicultural characters of this variety of *Pinus nigra*, which is named after the Abruzzi village where it occurs in pure stands. It is intermediate in character between *P. n.* var. *austriaca* and *P. n.* var. *calabrica*, and is particularly suited to dry, stony and calcareous soils.

2533. SCHREINER, E. J. **Report on a reconnaissance of *Pinus sylvestris* in Spain.** *Proc. 3rd Ntheast. For. Tree Improvemt. Conf., Ithaca 1955*, 1956 (38–42).

A short account of the distribution, taxonomy, morphology, and management of Scots Pine in Spain.

2534. ČERNJAVSKI, P. Belijat bor v Bălgarija. **[*Pinus sylvestris* in Bulgaria.]** *Gorsko Stopanstvo* 10 (6), 1954 (257–62). 16 refs. [Bulg.]

The main Bulgarian form differs from *P.sylvestris* as known in Germany, Scandinavia and Russia in Europe in the size of needles, cones and seeds, in the shape and size of the apophysis, polarization of the turpentine [said to be laevo-rotatory], and volume yield. There are also other minor forms in Bulgaria, detailed study of which is recommended.

2535. KRAJINA, V. J. **A summary of the nomenclature of Douglas Fir, *Pseudotsuga menziesii*.** *Madroño, Berkeley, Calif.* 13 (8), 1956 (265–7) 10 refs. E.B.

Gives a complete list of synonyms.

175.2. Monocotyledons

2536. FURTADO, C. X. **Palmae malesicae—XIX. The genus *Calamus* in the Malayan Peninsula.** *Gdns. Bull.* 15, 1956 (32–265).

Describes, with drawings and key, 72 species.

2537. HOLTTUM, R. E. **Two new Bamboos from the Malay Peninsula.** *Gdns. Bull.* 15, 1956 (274–5).

Schizostachyum terminale sp. nov. and *Gigantochloa ridleyi* sp. nov.

2538. HOLTTUM, R. E. ***Racemobambos*, a new genus of Bamboos.** *Gdns. Bull.* 15, 1956 (267–73).

Describes *Racemobambos* gen. nov. and 5 species —*R. glabra* sp. nov., *R. setifera* sp. nov., *R. hirsuta* sp. nov., *R. gibbsiae* (*Bambusa gibbsiae*), and *R. rigidifolia* sp. nov.

176.1. Dicotyledons

See also Nos. 2636, 2991, 3282–3.

2539. SINCLAIR, J. **Notes on New Guinea Annonaceae, Part 1.** *Gdns. Bull.* 15, 1956. (4–13).
Includes the description of one tree species, *Pseuduvaria lignocarpa* sp. nov.

2540. CHAKRAVARTY, H. L. **Revision of Indo-Burmese Rauwolfia.** *Bull. bot. Soc. Bengal* 9 (1), 1955 (1–9 + 2 plates). 25 refs. C.G.B.

2541. KOSTERMANS, A. J. G. H. **The genus *Cullenia* Wight (Bomb.).** *Commun. For. Res. Inst., Bogor* No. 51, 1956. pp. 8. [E.]
Key to the two species, *C. ceylanica* and *C. rosayroana*, and taxonomic descriptions.

2542. DESCAMPS, R. Les Élaeocarpacées de Nouvelle-Calédonie (étude d'anatomie et d'histologie comparées de la feuille). **[The Elaeocarpaceae of New Caledonia (comparative anatomy and histology of the leaf).]** *Ann. Sci. nat.* (*Bot.*) 17 (2), 1956 (187–257). 12 refs. [F.f.] O.B.D.
Includes a key to the species.

2543. DUVIGNEAUD, P. Géographie de caractères et évolution de la flore Soudano-Zambézienne. III. Les *Combretum* arborescents des savanes et forêts claires du Congo Méridional. **[Geographical distribution of characters and evolution of the Sudano-Zambesi flora. III. The woody *Combretum* spp. of the savannas and open forests of the Middle Congo.]** *Bull. Soc. Bot. Belg.* 88, 1956 (59–90). [F.] O.B.D.

2544. WHITE, F. **Notes on the Ebenaceae. II. *Diospyros piscatoria* and its allies.** *Bull. Jard. bot. Brux.* 26 (4), 1956 (277–307). 6 refs. [E.] O.B.D.
Deals with the taxonomy, morphology, range and ecology of *D. abyssinica*, *D. piscatoria* and *D. soubreana*. [Cf. *F.A.* 18 No. 147.]

2545. LÉONARD, J. Notulae systematicae XXI. Observations sur les genres *Oldfieldia*, *Paivaeusa* et *Cecchia* (Euphorbiaceae africanae). **[Notes on the genera *Oldfieldia*, *Paivaeusa* and *Cecchia*.]** *Bull. Jard. bot. Brux.* 26 (4), 1956 (335–43). [F.] O.B.D.
The three species of *Oldfieldia*, *Paivaeusa dactylophylla* and *Cecchia somalensis* are all included in the genus *Oldfieldia*. Some new combinations are proposed, and *O. macrocarpa* sp. nov. is described.

2546. LÉONARD, J. Notulae systematicae XXII. Contribution à l'étude des *Croton* africains (Euphorbiaceae). **[The African species of *Croton*.]** *Bull. Jard. bot. Brux.* 26 (4), 1956 (383–97). [F.] O.B.D.
Includes a description of a new tree species, *C. mayumbensis*.

2547. KOZDON, P. **The *Nothofagus* species of the Cordilleras.** New Zealand Forest Service, Wellington. [1956] pp. 8. Transl. from *Z. Weltforstwirt.* 18 (1), 1955 (7–16). [See *F.A.* 17 No. 205.]

2548. TUCKER, J. M. **The relationship between *Quercus dumosa* and *Quercus turbinella*.** *Madroño, Berkeley, Calif.* 12 (2), 1953 (49–60). K.
In the areas (S. Calif.) sampled, both species have been modified by interbreeding, but on 2 of the 3 transects examined they still tend to retain their morphological identities.

2549. TUCKER, J. M. **Two new Oak hybrids from California.** *Madroño, Berkeley, Calif.* 12 (4), 1953 (119–27). 10 refs. K.
Describes × *Quercus subconvexa* (*Q. durata* × *Q garryana*) and × *Q. howellii* (*Q. dumosa* × *Q. garryana*), both natural.

2550. MULLER, C. H. **A new species of *Quercus* in Arizona.** *Madroño, Berkeley, Calif.* 12 (5), 1954 (140–5). K.
Describes a new series, *Quercus* Ser. *Relictae*, and a new species, *Q. ajoensis*, from the Ajo Mountains, Arizona [cf. *F.A.* 18 No. 1361].

2551. MULLER, C. H. **The distribution of *Quercus boyntoni*.** *Madroño, Berkeley, Calif.* 13 (7), 1956 (221–5). 6 refs. E.B.
From specimens collected in Alabama and Texas, a morphological description is given of *Q. boyntoni*. Although closely related to *Q. stellata*, it is distinguished from it by its sprawling shrub-like habit, and the shape and texture of the leaves. It is found in sandy stream valleys and has also been recorded on the prairie and extending along ridges into Georgia.

2552. HENDERSON, M. R., and WYATT-SMITH, J. ***Calophyllum* Linn.** *Gdns. Bull.* 15, 1956 (285–375 + 32 photos, 1 tbl.)
Describes, with drawings, photographs and key, 46 Malayan species.

2553. COWAN, R. S. **Tropical American Leguminosae—III.** *Brittonia* 8 (4), 1957 (251–3).
Eperua glabra sp. nov., a 60-ft. tree, and *Paloveopsis emarginata* gen. et. sp. nov., a 35-ft. tree; both from British Guiana.

2554. VERDCOURT, B. **A new genus of Meliaceae from Eastern Africa.** *J. Linn. Soc.* (*Bot.*) 55 (361), 1956 (503–6). O.B.D.
The new genus *Pseudobersama* is based on *Bersama mossambicensis*.

2555. MCVAUGH, R. **Tropical American Myrtaceae. Notes on generic concepts and descriptions of previously unrecognized species.** *Fieldiana : Botany* 29 (3), 1956 (145–228).

2556. HOWARD, R. A. **Studies in the genus *Coccoloba*: II. The identification of *C. swartzii* Meisner and *C. barbadensis* Jacquin and their relatives. III. The Jamaican species.** *J. Arnold Arbor.* 37 (4), 1956 (317–39); 38 (1), 1957 (81–106).
(III) Describes, with key, 10 species, including one new (*C. proctori*, a 65-ft. tree). Common names include Wild Grape, Sea Grape, Crabwood and Zebrawood (*C. zebra*). [Cf. *F.A* 11 No. 1698.]

2557. SOBAJIMA, Y. **[Studies on the local distribution and formation of Zumi (*Malus sieboldii* Rehder). 1. Ecological and geographical distribution of Zumi in Hokkaido, Aomari, and Nagano district.]** *Scientific Reports of the Saikyo*

University (*Agriculture*), *Kyoto* No. 7, 1955 (77–80 + 2 plates). 11 refs. [Jap.e.]

The distribution of strains of *Pyrus sieboldii* with large and small leaves is discussed. *P. baccata* var. *mandshurica* is divided into 3 types: (*a*) arborescent, (*b*) and (*c*) dwarf, on sandy beaches and in volcanic ash zones respectively.

2558. VERDCOURT, B. **Notes from the East African Herbarium: IV.** *Kew Bull.* 1956 (1957), (445–54).

Includes *Cuviera semseii* sp. nov., a small tree, and *Lasianthus grandifolius* sp. nov., a small tree or shrub; both from Tanganyika. A key is also given to the Tanganyika species of *Lasianthus*.

18. Plant Ecology

See also No. 2401.

2559. ROL, R. Rapport au Gouvernement de l'Iran sur les études écologiques et systématiques sur la flore ligneuse de la région caspienne. **[Report to the Government of Iran on ecological and systematic studies on the woody flora of the Caspian region.]** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 520, 1956. pp. 64 + 10 photos. [F.] Limited distribution.

Makes recommendations for future studies, with a view to improved silviculture and pasture management, on the basis of studies made by the author during a 2-month tour of the region.

2560. PURI, G. S. **The present position of forest ecological research in India.** *Proc. 8th silv. Conf., Dehra Dun 1951*, Part 2, 1956 (26–31).

Briefly reviews the ecological research carried out in India down to 1950.

2561. PURI, G. S. **Advances in the ecology of Teak (*Tectona grandis* Linn. f.) in India.** *Proc. 8th silv. Conf., Dehra Dun 1951*, Part 2, 1956 (242–50). 38 refs.

A review of the subject with literature references. [Cf. *F.A.* 18 Nos. 2588–90, 2634.]

181. Mode of Life, Autecology. Silvicultural Characters of Trees

See also Nos. 2531–3, 3265.

2562. KOZDON, P. Los árboles forestales y las condiciones selvícolas de la cordillera de los Andes. **[Forest species and conditions of the Andes.]** *Montes, Madrid* 12 (72), 1956 (387–96). 19 refs. [Span.]

Describes the forests and climatic conditions of the Southern Andes. It appears that *Nothofagus* spp. are not demanding as regards climate and soils, and would give good yields if grown on good soils [cf. *F.A.* 17 No. 205]. Descriptions are given of the main forest species of the region and their silvicultural characters.

2563. BASBOUS, I., and TARADE, R. de. Notes sur l'écologie du cèdre du Liban. **[Notes on the ecology of *Cedrus libani*.]** *Publications de l'Université Libanaise* (*Section des Sciences Naturelles*), *Beyrouth* No. 1, 1955. pp. 24 + 13 photos. 27 refs. [F.]

2564. MORANDINI, R. Il larice nelle alpi orientali italiane. II. Il larice nella Venezia Tridentina. **[Larch in the eastern Italian Alps. II. Larch in the Venetian Trentino.]** *Publ. Staz. sper. Selv. Firenze* No. 10, 1956. pp. 270 + 5 maps. [It.it.f.e.g.]

Research on Larch in its natural range in the Eastern Alps was begun in 1933 by the experiment stations at Florence and Mariabrunn jointly. Vol. I, covering Lombardy, by Prof. Fenaroli, was published in 1936. Vol. II, now published, deals with Larch in the Venetian Trentino. Distribution is shown separately for a number of catchments on maps on a scale of 1 : 200,000, and for the whole region on 1 : 500,000, and is studied in detail for each sector in relation to topographical and climatic conditions. The following general conclusions are drawn. The area of Larch has not appreciably diminished during the period of study: it amounts to ca. 200,000 ha. of forest in which Larch constitutes 31% of standing stock. Larch usually grows between 900 and 2000 m. alt., particularly above 1300 m., and is most often found on fresh slopes, mainly with N. or N.W. aspects. It shows no preference for a particular soil, but rarely occurs on soils originating from granite and gneiss. It grows mainly in the upper zones under markedly continental climatic conditions, stands up well to fairly high temperatures, but is very demanding in respect of soil moisture. *From author's summary.*

2565. GUINIER, P. Le marronnier. **[*Aesculus hippocastanum*.]** *Rev. Bois Appl.* 10 (12), 1955 (5–7). [F.]

Describes the tree, its origin and distribution, plantations, and the structure, properties and uses of its wood.

2566. MERENDI, A. Il noce nero, *Juglans nigra* L. **[*J. nigra*.]** *Ital. agric.* 93 (11), 1956 (883–8). [It.] E.M.B.

Silvicultural characters, and possibility of use in Italy.

2567. JACOBS, M. R. **Growth habits of the Eucalypts.** Commonwealth Forestry and Timber Bureau, Canberra. 1955. pp. 262. 175 refs. Price £1. 10*s*.

A comprehensive review of the autecology of the Eucalypts, with chapters on: (1) the leafy shoots, (2) development and maintenance of mature crowns, (3) growth stresses, (4) gum veins, (5) silvicultural characters (seed, tree classes, lean, spacing and b.a., natural thinning, coppicing, root systems, bark, fire danger, aspect, wind damage, interception of rainfall, plant parasites), and (6) the effect of growth habits on the treatment of Australian Eucalypt forests.

2568. COOPER, L. G. **Some Nigerian high forest trees.** *Nigerian Field* 22 (1), 1957 (21–36).

Notes on crown and bole shape, branching, bark, blaze, buttresses, leaves, fruits, uses etc. with photographs and diagrams covering 22 species.

2569. Essências florestais da Guiné Portuguesa. 4; 5. **[Forest species of Portuguese Guinea. 4; 5.]** Jardim e Museu Agrícola do Ultramar, Ministerio

do Ultramar, Lisboa. 1956. pp. 15 + 5 plates; 15 + 4 plates. [Port.e.f.]

Morphology, habitat, nomenclature, range, and the anatomy, properties and uses of the wood of Câmbala (*Chlorophora regia*) and Pau Conta (*Afzelia africana*). [Cf. *F.A.* 17 No. 3693; 18 No. 1358.]

2570. MICHELSON, A. Études forestières: *Lebrunia bushaie* Staner. [**Forest studies; *L. bushaie***.] [*Publ.*] *Com. nat. Kivu* (*n.s.*) No. 8, 1957. pp. 43.

Covers botanical and habit description, distribution, forest associates, silvicultural characters, natural and artificial regeneration, physical and mechanical properties of the timber, and its uses, working qualities, seasoning etc. Illustrations cover morphology, silviculture, and appearance and anatomy of the timber.

2571. BHARGAVA, O. M. ***Anogeissus pendula* in Madhya Bharat.** *Proc. 8th silv. Conf. Dehra Dun 1951*, Part 2, 1956 (490–7). 9 refs.

Silvicultural characters, silviculture, and management are described in some detail.

181.1. Distribution, Natural Range

See also Nos. 2407, 2497, 2543–4, 2589.

2572. NOSEK, K. Die natürliche Verbreitungsgrenze der Weisstanne zwischen Frankenalb und Moräne. [**The limit of the natural range of Silver Fir in the area between the Franconian Jura and the moraines.**] *Forstwiss. Cbl.* 74 (11/12), 1955 (330–65). 140 refs. [G.g.]

A study was made and maps are presented of the natural range of *Abies alba* (as uninfluenced by human activity) in the Bavarian Foreland; the silvicultural significance of the findings is discussed.

2573. DUVIGNEAUD, J., and LEBEAU, J. Note sur la distribution de *Quercus lanuginosa* Lamk. [**The distribution of *Q. lanuginosa* [in Belgium].**] *Bull. Soc. Bot. Belg.* 88, 1956 (129–32). 4 refs. [F.] O.B.D.

2574. KHAN, M. S. ***Santalum album* (Sandal) in Hyderabad State.** *Indian For.* 83 (1), 1957 (23–5 + 2 plates).

Sandal occurs in the N.W. part of the state, at the southern limit of its range, and appears to be free from spike disease. The use of Hyderabad as a seed source is recommended.

181.2. Atmospheric Relations. Acclimatization

See also Nos. 2407, 2768, 2869.

2575. MIROV, N. T. **Photoperiod and flowering of Pines.** *For. Sci.* 2 (4), 1956 (328–32). 8 refs.

Tabulates the abundance of ♂ and ♀ flowers at 28–30 years in Pines planted at Placerville and Berkeley, Calif. (38° N), including 6 species from 40–70° N and 28 species from 15–39° N. In no case was any correlation found between photoperiod and abundance of flowering and it is tentatively concluded that all the Pines investigated are neither long- nor short-day plants, but neutral.

2576. VOLOŠIN, M. P. Otnošenie lavra blagorodnogo k svetu. [**The relation of *Laurus nobilis* to light.**] *Bot. Ž.* 41 (11), 1956 (1652–6). 9 refs. [Russ.]

Discusses the anatomy of light and shade leaves and the effect of light on shoot growth, length of growing season, rate of photosynthesis, and yield of essential oil (which is much reduced by shade).

2577. ŠMATOK, I. D. Vlijanie prodolžiteljnosti dnja v poljarnyh uslovijah na soderžanie uglevodov i mineraljnyh veščestv u želtoï akacii i obyknovennoï sireni. [**The influence of day-length in polar conditions on the content of carbohydrates and mineral constituents in *Caragana arborescens* and *Syringa vulgaris*.**] *Dokl. Akad. Nauk. SSSR* 111 (1), 1956 (213–6). 9 refs. [Russ.] A.P.B.

Observations were made in the Murmansk region in June 1951 and August 1953 on 2-year-old *S. vulgaris* and 4-year-old *C. arborescens* subjected to a 10-hour day. Tabulated data show the amount of dry matter per 100 plants, mineral constituents, and carbohydrate content, as compared with controls exposed to a polar day. With short photoperiods total dry weight was reduced, especially in *C. arborescens*; all parts of the plant, in both species, showed higher contents of N, P and K, but a lower Ca content; and in both species there was a decrease of leaf carbohydrates, but an increase of soluble carbohydrates in stem and roots.

2578. TILL, O. Über die Frosthärte von Pflanzen sommergrüner Laubwälder. [**The frost-hardiness of plants occurring in deciduous forest.**] *Flora, Jena* 143 (4), 1956 (499–542). 30 refs. [G.g.] O.B.D.

Frost hardiness was measured by Pisek's method [cf. *F.A.* 16 No. 2665] over the years 1952–54 in 24 species of the ground flora and 19 deciduous tree species in the neighbourhood of Göttingen. In almost all species of the ground flora there was a difference in frost hardiness between the different organs of the plants, the less sheltered organs being more frost-hardy than the sheltered ones; the differences increased in winter and decreased in summer. There were also differences between organs of different ages. In all organs of all species there was a marked periodicity in hardiness, with a winter maximum and a summer minimum. Danger of injury was greatest in spring (April and May), less in winter, and least in autumn. In spring, young leaves of early-flushing trees and plants were on the whole hardier than those of the late-flushing species. Subterranean organs were, in general, hardier in March 1952, when the soil was slightly frozen, than in the warmer March of 1953. A definite relationship existed between the form of the plants and their frost hardiness. Buds of phanerophytes were the most frost-resistant, and those of the geophytes most sensitive. Continental species were usually hardier (at least in winter) than maritime species.

2579. LEVITT, J. **The hardiness of plants.** Academic Press Inc., New York. 1956. pp. viii + 278. 45 pp. of refs. Price [£2.16*s.*]

A review of the subject with copious references to the literature, under the heads of resistance to low

temperatures, to drought, and to high temperatures. Much of the material cited refers to forest trees.

181.3. Water, Soil and Root Relations (including Bacterial and Mycorrhizal Symbiosis)

See also Nos. 2415, 2418–9, 2421, 2429, 2437, 2440, 2579, 2759–60, 2778, 2828, 2953, 3192, 3196, 3200.

2580. Morishita, Y., and Manabe, T. **[Studies on the improvement of poor land (1). On drought and humidity resistance of fertiliser trees.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 88, 1956 (37–64 + 44 photos). 9 refs. [Jap.jap.e.]

Stem and root growth (10 woody species photographed) were studied in 12-in. pots, the soil water of which was held at 5, 10, or 20%, at maximum capacity, or submerged. In the following list the first figure represents the order of drought resistance and the second that of humidity resistance (the higher the number, the greater the resistance): *Pinus densiflora*, 1, 2; *Alnus firma*, 2, 2; *Alnus pendula*, 2, 2; *Cytisus scoparius*, 2, 5; *Acacia dealbata*, 2, 4; *Acacia decurrens* var. *mollissima* 2, 4; *Robinia pseudoacacia* var. *bessoniana*, 3, 3; *Amorpha fruticosa*, 3, 1; *Myrica rubra*, 5, 4; *Festuca elatior* var. *arundinacea*, 5, 1; *Alnus tinctoria* var. *glabra* 6,1. This last and *A. fruticosa* are weakened by submersion but show remarkable recuperation after new root and nodule growth.

2581. Cappelletti, C. Ricerche sulle variazioni giornaliere dell'acqua nelle piante alpine in relazione alla quota ed alla stazione. **[The daily variations of water content in Alpine plants in relation to altitude and site.]** *Nuovo G. bot. ital. (n.s.)* 60 (3), 1953 (1954), (351–433). 44 refs. [It.it.e.] A.P.B.

A study was made of the water balance of plants at a number of Alpine stations between 100 and 2300 m. altitude. Measurements were made, from morning to evening, of the degree of imbibition (water as % of dry weight) and degree of succulence (water/100 sq. cm. of leaf surface). The two values are independent of one another and variations are generally accentuated at higher altitudes and on bare soil. On the basis of their degree of succulence, the author classifies plants as *isosucculent* and *anisosucculent*, and according to their degree of imbibition as *isoimbibed* and *anisoimbibed*. Among the species studied were *Pinus cembra*, *P. sylvestris*, *Picea abies*, *Larix decidua* and *Populus tremula*.

2582. Wright, T. W. **Abnormalities in nutrient uptake by Corsican Pine growing on sand dunes.** *J. Soil Sci.* 8 (1), 1957 (150–7). 17 refs.

Monthly variations in foliar N, K, Ca, Mg and P_2O_5 of young Pine growing on dunes in Culbin forest, Morayshire, are compared with monthly changes of available moisture in the rooting zone, basing calculations on Penman's formula. A reversal of normal seasonal trends was observed in the second half of the growing season. In trees showing poor growth, heavy thinning delayed the drying out of the rooting zone and temporarily improved the K, Mg and N levels in the foliage. [Cf. *F.A.* 17 No. 3581.] *From author's summary.*

2583. Klausing, O. Untersuchungen über den Mineralsalzumsatz in Buchenwäldern auf Granit und Diorit. **[Investigations into the exchange of mineral salts in Beech forests on granite and diorite.]** *Forstwiss. Cbl.* 75 (1/2), 1956 (18–32). 11 refs. [G.g.]

Presents data from a year's investigations on dry-matter production by the vegetation, the mineral content of its ash, and the chemical constituents of the soil at different levels and of the percolating soil water. The mineral cycle is traced and discussed. The difference between the granite and diorite sites in the supply of mineral salts is reflected in the vegetation; the granite site showed a relative lack of Mg. It was demonstrated that both sites are a climax from the point of view of both soil and vegetation, in which there is an equilibrium between processes of synthesis and decomposition.

2584. Miyazaki, S., Sato, T., and Oikawa, K. **[On the effects of supplying and depriving of N, P_2O_5, K_2O for various periods on the growth of *Cryptomeria japonica* D. Don (Sugi) seedlings.]** *Bull. For. exp. Sta. Meguro, Tokyo* No. 88, 1956 (21–36 + 7 photos). 13 refs. [Jap.jap.e.e.]

From seed sown on 10th May in quartz sand, seedlings were transferred on 4th June to pure water culture and thence on 10th June to the following series of treatments: (*a*) Complete NPK nutrient solution for 140, 100, 80, 60, 40 and 20 days, withholding at each stage N, or P, or K; (*b*) withholding N or P, or K initially for 20, 40, 60, 80, 100 and 140 days. The appropriate solution was replaced at 5-day intervals and the seedlings measured and photographed on 28th Oct. Data are presented in tables and graphs with legends in English.

2585. Okinaga, T., Sasaki, S., and Takagi, Y. **[Physiological studies on the nitrogen nutrition of *Larix leptolepis* seedlings. Effects of [I] fertilized nitrogen levels. II. Split [successive] application of nitrogen fertilizer, on the seasonal changes in contents of various nitrogenous and carbohydrate fractions in one-year *Larix* seedlings.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 88, 1956 (1–20). 32 refs. [Jap.jap.e.e.]

Larch seed was sown and supplied with N at 265, 150, 55 and 0 kg./ha. and the seedlings were harvested at 20-day intervals for the determination of total N, protein-N, NH_4-N, residual N, amide-N, reducing and non-reducing sugar and crude starch (data tabulated and graphed). Growth increased with the amount of N supplied, each of the compounds except non-reducing sugar showing its own peculiar trend (graphs). The N compounds, but not the carbohydrates, increased at every stage parallel with the N supplied, as did the rate of protein synthesis; it was only slight when no N was supplied. In mid-September, previous to leaf yellowing, residual N and soluble carbohydrates increase considerably in the seedlings, indicating a translocation out of the leaves. Four stages of development are recognized: (1) germination to the end of June with growth at the expense of hydrolysed reserves of the seed; (2) vigorous growth due to active protein- and photo-synthesis in July; (3)

reduced growth from August to mid September with a reduction of N, and C assimilation; (4) thereafter, translocation of reserve materials from the leaves.

A similar investigation in which the amounts and time of application (April–June) of P_2O_5 and K_2O were constant but a fixed amount of N (378 kg./ha.) was applied in 1, 2, 3, or 4 dressings variously in mid April, June, July, August and September. Seedlings with a single (April) dressing of N showed the worst growth and in the successive applications growth become rapidly worse as the fraction of N applied after mid-July increased The seasonal trend of the substances analysed is discussed with graphs. Dressings of N in stage (2) (see last para. of I above) are of outstanding benefit.

2586. EGBERTS, H. De invloed van de zuurgraad (pH) van de grond op de verschillende boomkwekerijgewassen. [**The effect of soil pH on different nursery plants.**] *Jaarb. Proefsta. Boomkwek. Boskoop 1954* [1955] (79–84). [Du.]

[Cf. *F.A.* 18 No. 1369.] Tabulates the optimum pH for a number of species, including *Buxus sempervirens*, *Taxus baccata* and ornamental varieties of *Ilex aquifolium*, *Juniperus chinensis* and *Thuja occidentalis* on wet peat soils, and *Acer platanoides*, *A. pseudoplatanus*, *Aesculus hippocastanum*, *Betula pendula*, *B. pubescens*, *Carpinus betulus*, *Fagus sylvatica*, *Fraxinus excelsior*, *Quercus borealis* and *Q. robur* on sandy soils.

2587. TOD, H. **High calcium or high pH? A study of the effect of soil alkalinity on the growth of Rhododendron.** *Miscellaneous Publication, Edinburgh & East of Scotland College of Agriculture, Edinburgh* No. 164, 1956. pp. 6. 6 refs. E.U.

In order to determine whether the well known inability of Rhododendrons and many other ericaceous plants to grow on soils containing free lime is due to the alkalinity of the soil (i.e. a pH effect), or to the toxic action of Ca itself, or to a deficiency of some other element induced by excess of Ca in the soil, Rhododendron seedlings were grown in pots, in compost given different treatments. The species used was *R. davidsonianum*, which produces optimum growth at about pH 5·7. The compost, a mixture of acid soil from an old felled wood, known to be low in Ca, and ordinary granulated peat, was divided into 3 lots (*a*) control, (*b*) with the addition of 85 g. $MgCO_3$ to 22½ lb., (*c*) with the addition of 153 g. $MgCO_3$ to 24½ lb. After 3 years the pH in the pots was 5·2, 6·8, and 7·9 for (*a*), (*b*) and (*c*) respectively, and exchangeable Ca 0·87, 1·19, and 1·05 m.e./100 g. soil. In such a poor mixture, strong free growth could not be expected, but all seedlings made slow, steady progress, and the foliage showed no sign of the characteristic yellowing that occurs in soils of high pH. While the exchangeable Ca is raised in (*b*) and (*c*), the increase is very small compared with that which would be shown by a soil containing sufficient Ca to reach the same pH, where the Ca level would be 30–40 m.e./100 gm. soil. It therefore seems fair to say that the results show that soil pH values raised to what would be toxic levels if the raised pH were due to Ca, had no serious ill effects when produced by $MgCO_3$, and that alkalinity *per se* is not the cause of the harmful effects produced by alkaline soils on 'calcifuge' plants, at any rate, in Rhododendron.

2588. BHATIA, K. K. **Contribution to the ecology of Teak (*Tectona grandis* Linn.f.) in Madhya Pradesh.** *J. Indian bot. Soc.* 35 (3), 1956 (357–64). 21 refs. O.B.D.

Presents some further data from a study made in 1952–54 [see *F.A.* 17 No. 3707] and discusses the discontinuous distribution of Teak in Madhya Pradesh, pH of the soils, and the Ca requirements of Teak and its significance. [Cf. *F.A.* 18 No. 2561.]

2589. KULKARNI, D. H. **Distribution of Teak (*Tectona grandis*) on the northern slopes of the Satpuras, with special relation to geology.** *Proc. 8th silv. Conf., Dehra Dun 1951*, Part 2, 1956 (254–66). 9 refs.

With comments by *R. S. Gupta.* Extensive observations failed to establish any significant correlation between the distribution of Teak and altitude, topography, aspect, rainfall, temperature, or biotic factors. A correlation was, however, found with geographical formation, the proportion of Teak varying from 80% on rocks of the Deccan Trap Series to none on sandstones.

2590. GUPTA, R. S. **On the suitability of soils for Teak plantations with special reference to laterization.** *Proc. 8th silv. Conf., Dehra Dun 1951*, Part 2, 1956 (266–9). 6 refs.

An experiment is in progress to determine the effect of planting pure Teak on forest soils with a tendency to laterization. Preliminary [25-year] results indicate that there is little change in the chemical nature of the soil. In particular, the SiO_2/R_2O_3 ratio, which is the index of laterization of soil, shows the same trends under both natural forest and Teak plantation. [Cf. *F.A.* 11 No. 2494.]

2591. PARKER, C. A. **Evolution of nitrogen-fixing symbiosis in higher plants.** *Nature, Lond.* 179 (4559), 1957 (593–4). 14 refs.

Discusses the possible origin of such symbiotic associations as those of the Leguminosae, the fungal symbiosis in root nodules of *Alnus*, *Myrica* and *Hippophaë*, the bacterial leaf nodules of the Rubiaceae etc.

2592. BOND, G., and GARDNER, I. C. **Nitrogen fixation in non-legume root nodule plants.** *Nature, Lond.* 179 (4561), 1957 (680–1). 8 refs.

Tabulates recent values for rates of fixation by *Myrica gale*, *Hippophaë rhamnoides* and *Alnus glutinosa*, considerably higher, mainly because of improved cultural techniques, than those previously obtained. Other literature is briefly discussed and the possibility of further exploiting such plants is considered. [Cf. *F.A.* 17 No. 1333.]

2593. TAUBERT, H. Über den Infektionsvorgang und die Entwicklung der Knöllchen bei *Alnus glutinosa* Gaertn. [**The process of infection and the development of nodules in *A. glutinosa*.**] *Planta* 48 (2), 1956 (135–56). 22 refs. [G.g.] O.B.D.

Describes and illustrates in detail observations on these processes.

2594. POMMER, E.-H. Beiträge zur Anatomie und Biologie der Wurzelknöllchen von *Alnus glutinosa* Gaertn. [**Anatomy and biology of root nodules of *A. glutinosa*.**] *Flora, Jena* 143 (4), 1956 (603–34 + 3 plates). 49 refs. [G.g.] O.B.D.

Presents the results of experiments in the isolation of nodule-forming microorganisms and in the artificial inoculation of seedlings with the isolations, and of studies of the course of development of the nodules and the relationship between host and endophyte, with particular reference to anatomy.

2595. LEVISOHN, I. **Observations on the mycorrhizal habit of forest trees.** *Emp. For. Rev.* 36 (1), 1957 (85–90). 11 refs.

Notes on the occurrence, distribution, incidence and types of infection in forest trees made during the course of research. The author claims that all forest trees are able to form mycorrhizal associations, with the possible exception of *Eucalyptus* spp. The difficulty of diagnosing endotrophic mycorrhizae has led to the assumption that certain species are non-mycorrhizal. A lack of mycorrhizal infection in fast-growing trees may be caused by a sugar deficit in the roots. Multiple mycorrhizal infections were frequently observed.

2596. DOAK, K. D. **Pine root reaction in sterile culture to mycorrhizal and other fungi.** *Amer. Midl. Nat.* 54 (2), 1955 (443–51). 12 refs. B.A.P.

Several modifications in design and assembly of simplified sterile culture chambers for growing individual plants were tested with 5 suspected root fungi on two species of Pine. Root reactions in the development of mycorrhizal and parasitic infections were compared. *Boletinus pictus* and *Boletus miniato-olivaceus* formed a type of Hartig network and mantle characteristic of certain Pine mycorrhizae in nature. *Armillaria mellea* produced rhizomorphs and an intracellular penetration resembling its previously reported parasitic behaviour under natural conditions. A new combination of mycorrhizal and associated structures produced by AS 34–3 (sterile mycelium) on *Pinus taeda* is described. *Author's summary.*

2597. MOSER, M. Die Bedeutung der Mykorrhiza für Aufforstungen in Hochlagen. [**The significance of mycorrhizae for afforestation at high altitudes.**] *Forstwiss. Cbl.* 75 (1/2), 1956 (8–18). 19 refs. [G.g.]

Reports observations and trials with mycorrhizae in mountain sites supporting mainly *Pinus cembra*, *Larix decidua* and *Picea abies*, and discusses the possibility of extending the forests above the present timberline. The development of mycorrhizae of *Pinus cembra* was observed in relation to the enzyme activity of the soils. Specialization in mycorrhizal fungi is discussed along with the different physiological behaviour of some fungi in relation to the host species and methods of artificial inoculation with cultures. A report is given on afforestation trials at 2050–2200 m. alt., in which both artificially inoculated and uninoculated Spruce planting stock were used. *From author's summary.*

2598. DAY, W. R. **Sitka Spruce in British Columbia: a study in forest relationships.** *Bull. For. Comm., Lond.* No. 28, 1957. pp. vi + 110 + 57 photos. 14 refs. Price £1.

This study, based on field work in two small regions of the coastal forest in British Columbia (Graham Island, and Terrace in the Skeena River catchment), is described by the author as 'an attempt to make some preliminary observations on the origins and effect of limitations in soil conditions on the growth of trees, as seen in association in mixed forest'. The specific subjects of study were: (*a*) the rooting depth of Sitka Spruce in varying edaphic situations; (*b*) the changes that occur in the constitution of the forest, with special regard to Sitka, as edaphic situations vary; (*c*) the effect of varying edaphic situations on the health and development of the root and crown of Sitka; (*d*) the conditions under which Sitka has an advantage in production relative to its associated species. The research data are presented in 28 tables and 25 diagrams, and there are numerous photographs.

2599. MAKAREVIČ, V. N. Neskoljko nabljudeniĭ nad suhoputnymi rastenijami v zone podtoplenija i periodičeskogo zatoplenija Rybinskim vodohraniliščem. [**Some observations on land plants in the waterlogged or periodically flooded zone of the Rybinsk reservoir.**] *Bot. Ž.* 41 (11), 1956 (1647–52). [Russ.]

In summer 1949 and 1950, when the water-table reached the soil surface at the edge of this new reservoir, aerial root tips were observed in *Salix pentandra*. The roots, which were pink, fleshy and without root-hairs, developed from the ordinary roots in the soil and protruded 1–2 cm. above ground at a radius of 2 m. from the tree. The cortical parenchyma was particularly well developed and formed the greater part of the root; it was very porous, with large intercellular spaces caused by irregular cell division. Similar roots were also observed in *S. nigricans* and *S. fragilis*. Where the water-table was raised by the filling of the reservoir from 5–8 m. to 113 cm. below soil surface, the annual height increment of 20-year-old *Pinus sylvestris* increased from 20–30 cm. to 40–50 cm. On lower sites with various degrees of waterlogging, growth was reduced, and Pines growing on the water's edge appeared to be moribund.

181.4. Reaction to Biotic Influences and Fire

See Nos. 2629–30.

181.5. Reproductive Behaviour

See also Nos. 2575, 2632, 2672, 2692 *et seq.*

2600. SANTAMOUR, F. S. **Hermaphroditism in *Populus*.** *Proc. 3rd Ntheast. For. Tree Improvemt. Conf., Ithaca 1955*, 1956 (28–30).

Examination of 10 catkins from each of some 600 trees (300 ♀ and 354 ♂) of *P. tremuloides*, both wild and artificially bred, showed that ca. 48·7% of ♀s bore some ♂ flowers, and 2·8% of ♂s some ♀ flowers. These probably represent minimum figures since only one out of the 10 catkins from many trees showed abnormal flowers, and no doubt some of the apparently unisexual trees did in fact have both kinds.

2601. PAULEY, S. S., and MENNEL, G. F. **Sex ratio and hermaphroditism in a natural population of Quaking Aspen [*Populus tremuloides*].** *Minn. For. Note* No. 55, 1957. pp. 2.

Analysis of the flowers of 206 trees in a native Minnesota population showed a sex ratio of 3 ♂ : 1 ♀ tree. Incidence of hermaphroditism in ♀ trees was 20·6%, and in ♂ trees 4%. [Cf. preceding abstract.]

2602. GRAHAM, B. F., JR. **Labelling pollen of woody plants with radioactive isotopes.** *Ecology* 38 (1), 1957 (156–8). 3 refs.

Experiments with stem-injected P^{32} [cf. *F.A.* 16 No. 79] indicate that its movement in deciduous plants before leaf expansion is slow and erratic, while in conifers it becomes widely distributed throughout the plant, but not evenly distributed among the branches. Conifer pollen can be labelled, *in vivo*, with P^{32} introduced into the trunk or branch. Pollen from such a tree can be identified, and dispersion patterns determined.

2603. DOW, A. S. ***Libocedrus decurrens* (Incense Cedar).** *Scot. For.* 11 (1), 1957 (43–4).

Records what is believed to be the first occurrence of cone production by this species in Scotland.

2604. LICITIS-LINDBERGS, R. **Branch abscission and disintegration of the female cones of *Agathis australis* Salisb.** *Phytomorphology* 6 (2), 1956 (151–67). 9 refs. O.B.D.

A detailed study of these processes, both of which are characteristic of the tree.

2605. **Lodgepole Pine cone opening characteristics on clear cuttings.** *Rep. Intermt. For. Range Exp. Sta. 1955* [1956] (7).

Observations in the first year of study showed effects of aspect and height above ground on the opening of cones on slash. On the ground surface, all cones on southerly and few on northerly aspects opened rapidly and completely; at 6 in., cones on southerly aspects partially opened, and at 1 ft. no cones opened.

2606. ASAKAWA, S. **[Studies on the delayed germination of *Fraxinus mandshurica* var. *japonica* seeds. (4) On water absorption.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 87, 1956 (75–84). 8 refs. [Jap.e].

The course of water absorption in this variety, included with *F. excelsior* in a previous study on 8 species of Ash as having immature embryos [cf. *F.A.* 18 No. 1391], is compared with that of *F. japonica* from the group with mature embryos. Seeds, with and without pericarps, were weighed over a 9-month period under various treatments of alternating temperatures, up to germination. Water absorption increased rapidly at first, then more slowly and finally accelerated again before germination. Movement from the 2nd to the 3rd phase was effected in *F. mandshurica* var. *japonica* only by pretreating for 3 months at 25° C. and 3 at 2°, followed by an alternation of 25° for 8 hours and 8° for 16. Delay in germination cannot be ascribed to water deficiency since most of the water required had been absorbed by seed both with and without pericarps in the 1st phase.

2607. GARRARD, A. **The effect of fruit sap on the germination of four species of tropical plants.** *Gdns. Bull.* 15, 1956 (276–84).

Freshly washed and dried seeds of *Fagraea fragrans* do not germinate on filter paper in distilled water, but if a diluted extract of the berry sap is added there is a 90–96% germination in 12–14 days. The 'active principle' causing germination is filterable and thermo-stable at 100° C. It is not a hydrogen-ion concentration or an auxin. Germination can also be effected in washed dried seed by refrigeration at 10° C. for 1–21 days before the germination test. Ten-day-old seed will germinate if supplied with 10-day-old berry sap which has been autoclaved and stored, or if first refrigerated before testing. The washed dried seed of *Muntingia calabura* gives 61·5% germination on filter paper in distilled water when fully ripe, but this is inhibited by sap extracts from its own fruit. The germination of the seed of *Melastoma malabathricum* is unaffected by sap extracts from its own fruit. The germination of the seed of *Duranta plumieri* is inhibited by berry extracts at high concentrations but unaffected at lower concentrations. From the effect of alien sap on seed germination it is likely that the active principle affecting the germination of these seeds is the same in all cases. *From author's summary.*

2608. MCMILLAN, C. **Variations in seedlings of *Cupressus abramsiana* Wolf.** *Madroño, Berkeley, Calif.* 12 (1), 1953 (28–30). K.

The great differences in germination rates of seed from 3 populations, cotyledon numbers, and other seedling characteristics, are discussed as a means of clarifying the relationship between *C. abramsiana*, *C. sargentii*, *C. goveniana* and *C. pygmaea*.

2609. **Physiology of germination [of *Elaeis guineensis*].** *Rep. W. Afr. Inst. Oil Palm Res. 1955/56*, 1956 (96–102).

Reports studies of the effect of temperature on the rate of elongation of excised embryos, influence of temperature and O_2 concentration on germination, effect of kernel storage at 30° and 40° C. on elongation of excised embryos, and germination of nuts stratified in moist sand. [Cf. *F.A.* 17 No. 2565.]

181.6. Life Form, Habit. Post-Seedling Development and Form

See also Nos. 2598, 2604, 2869, 3195–6, 3199–3200, 3207.

2610. MEYER, H. Beitrag zum Kronenaufbau der Fichte. **[The structure of Spruce crowns.]** *Forst u. Jagd* 5 (6), 1955 (234–5). [G.]

Weights of branches and needles removed in pruning to 14·3, 30, 40 and 60% of live-crown height in dominant and co-dominant Spruce aged 20–40 years (yield classes I–III/IV) averaged 17·1, 28·3, 60·7 and 78·1% respectively of total crown weights. As the proportion by weight of shade-crown varied among these trees from 20 to 30%, removal of 20%

of live crown would appear to leave the light-crown substantially intact.

2611. Chroust, L. O příčinách tvorby kmenových výstřelků na dubech. [**Causes of epicormic formation on Oaks.**] *Sborn. čsl. Akad. zeměd. (Lesn.)* 29 (6), 1956 (427–44). 10 refs. [Cz.cz.russ.g. *russ.g.*]

Observations and measurements made in a 22-year pure Oak pole stand (d.b.h. 5·8 ± 2·9 cm.; mean height 10 m.) yielded the following general results: the correlation coefficient between the quantity of epicormics and (1) d.b.h. was only 0·095, (2) crown size 0·083, and (3) illumination of the stem 0·670. No significant relationship was found between the quantity of epicormics and soil moisture.

181.7. Duration, Longevity, Stature; Records of Exceptional Age or Size. Effects of Age on Behaviour

See also Nos. 2688, 2770.

2612. Billings, W. D., and Thompson, J. H. **Composition of a stand of old Bristlecone Pines in the White Mountains of California.** *Ecology* 38 (1), 1957 (158–60). 1 ref.

An ecological study was made of the recently discovered stands of *Pinus aristata*, some of which are believed to be ca. 4000 years old [cf. *F.A.* 18 No. 1984]. Under present conditions the Bristlecone Pine forest is not reproducing itself, and the surviving stands are mostly confined to dolomite. Most of the trees were possibly seedlings under more favourable climatic conditions.

181.8. Phenology

See also Nos. 2495, 2575–8, 2640, 2753, 2772, 3096, 3296–8.

2613. Dolgošov, V. I. Geografičeskaja izmenčivostj sezonnogo razvitija drevesnyh i kustarnikovyh rasteniĭ. [**Geographical variation in the seasonal development of trees and shrubs.**] *Bot. Ž.* 41 (11), 1956 (1638–41). 9 refs. [Russ.]

From data collected over many years for a variety of [unspecified] deciduous trees and shrubs, the author has worked out, in % of the number of species under observation in any one locality, the number of species entering a given phase of development in that locality, by 10-day intervals. He gives three typical graphs of such figures for the northern taiga, central Russia, and the Black Sea region, recording the following phases: flushing, start of flowering, first ripe fruit and seed, full autumn coloration, and leaf-fall.

2614. Buckland, D. C. **Terminal shoot growth of four western conifers for a single growing season.** *For. Chron.* 32 (4), 1956 (397–9).

Gives the results of measurements made in 1940 on 8 trees each, 8–10 years old, of *Pseudotsuga taxifolia*, *Abies grandis*, *Tsuga heterophylla*, and *Thuja plicata*.

2615. Silver, G. T. **Some growth characteristics of Eastern White Cedar, *Thuja occidentalis* L.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (6), 1956 (1).

Radial growth on 4 sides and shoot elongation were measured throughout a growing season on 4 trees. Radial and terminal growth started slowly and reached a maximum in the last half of July. Lateral and side shoot increment was greatest in the early part of the growing season and decreased steadily after the middle of June. All growth was completed by the end of September.

2616. Morris, W. G., Silen, R. R., and Irgens-Moller, H. **Consistency of bud bursting in Douglas Fir.** *J. For.* 55 (3), 1957 (208–10). 1 ref.

Forty-year-old Douglas Fir in three plantations in Washington and Oregon, grown from seed from 13 different seed sources, retained the flushing characteristics of the parent tree. Phenological observations over 22 years revealed that though flushing took place 2–3 weeks later in the two plantations at a higher altitude, trees flushed in the same order in all plantations, according to seed source. Early-flushing trees came from wide valleys with warm spring days and nights. Late-flushing trees came from narrow valleys with warm days and cold nights in spring. The date of flushing had no apparent relation to height growth.

2617. Galahov, N. N. Vlijanie reljefa i èkspozicii na hod osennih fitofenojavleniĭ. [**The influence of relief and aspect on autumn phenological phases.**] *Bot. Ž.* 41 (11), 1956 (1677–84). 5 refs. [Russ.]

Gives data on the beginning and duration of autumn coloration and leaf-fall in *Betula mandshurica* var. *japonica*, *B. costata*, *B. fruticosa*, *Larix dahurica*, *Populus tremula*, *Tilia amurensis*, *Acer mono* and *Rhododendron dahuricum*, growing on N. and S. slopes in a valley in the Amur province.

2618. Hejtmánek, J. Časně a pozdně rašící forma buku. [**The early- and late-flushing forms of Beech.**] *Lesn. Práce* 35 (4), 1956 (167–71). 4 refs. [Cz.]

Early-flushing *Fagus sylvatica* was found to be prevalent in *Fagetum luzuletosum* on poor sites, late-flushing in *Fagetum herbosum* (good soil and shaded sites). The modal d.b.h. values for even-aged trees in *Fagetum luzuletosum*, observed on the same day (total population 466) were 38·7, 36·5 and 33·0 cm. for late-, medium- and early-flushing trees, respectively.

2619. Hesmer, H. Die Späteiche in Westfalen und im Rheinland. [**The late-flushing Oak in Westphalia and the Rhineland.**] *Forstarchiv* 26 (9), 1955 (197–203). 12 refs. [G.]

The annual loss in 1949 from the Oak leaf-roller (*Tortrix viridana*) was estimated at 75,000 cu.m. over 50,000 ha. in the N. Rhine-Westphalian region. Stands of a late-flushing variety of *Q. robur* of foreign, probably Slavonian, provenance escaped with little or no damage in 1952, when neighbouring Oak stands suffered severely. The delay in flushing is 2, 3 or even 4 weeks. As no effective method of controlling the pest has been found, the author recommends the use of seed from late-flushing Oaks. These also escape the spring frosts, give a high volume increment, and have straight boles,

although experience in France has shown them to be susceptible to early autumn frosts and to mildew.

182. Synecology, Plant Sociology: General, Principles and Methods

2620. OOSTING, H. J. **The study of plant communities.** W. H. Freeman & Co., San Francisco. 2nd ed. (rev.) 1956. pp. viii + 440. 439 refs. Price $6·00 (£2. 11*s.*). [Cf. *F.A.* 10 No. 2480.]

2621. RICHARD, J.-L. La phytosociologie au service de la sylviculture dans le canton de Neuchâtel. [**Plant sociology in the service of silviculture in the canton of Neuchâtel.**] *Schweiz. Z. Forstw.* 108 (1), 1957 (1–15 + 2 plates). 19 refs. [F.g.]

Gives examples from actual problems of the canton, e.g. the afforestation of the Montagne de Boudry, for which a vegetation sketchmap and profile are presented. The plant communities of the canton are briefly discussed, and the need for further work is stressed. The existing Swiss vegetation maps are listed.

2622. KLIKA, J.; MIKYŠKA, R. K otázkám lesní typologie. [**Problems of forest typology.**] *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 29 (2), 1956 (135–50 + 1 tbl.) 10 refs. [Cz.russ.g.]

In the first part (Principles of the methods used in phytocoenological forest research, by J. Klika) the author shows that phytocoenological units (as understood by the Braun-Blanquet school) form a reliable basis for typological work. Geobotanical mapping is a sound and necessary preliminary step, completing the typological maps. In the second part (Methodical data for the phytocoenological forest analysis, by R. Mikyška), the author illustrates the use of phytocoenological investigations in forest typology by actual examples.

182.1. Palaeoecology. History of Vegetation. Pollen Analysis

2623. EDLIN, H. L. **Spruce in pre-historic Shetland.** *Scot. For.* 11 (1), 1957 (42–3).

Discusses the discovery of Spruce wood in the remains of neolithic buildings in the Shetlands, and the relative probability of its being derived from logs drifted over from N. America or from trees growing in Shetland as an extension of the normal range in Norway.

2624. RODENWALDT, U., and HAUFF, R. Die Waldgeschichte des Villinger Stadtwaldes (Schwarzwald-Baar). [**The forest history of Villingen municipal forest (Black Forest-Baar).**] *Allg. Forst- u. Jagdztg.* 128 (1), 1957 (19–26). 13 refs. [G.g.e.]

The changes in composition of a forest of 3800 ha. on the S.E. slopes of the Black Forest on Triassic bunter sandstone, alt. 750–900 m., are traced from pollen analyses and old records. Silver Fir, presumably the main species of the undisturbed forests, later lost ground to Pine and Spruce; (present composition is 65% Spruce, 13% Fir, 21% Pine and 1% Beech). Beech apparently never occurred to any extent on the sandstone, presumably because of the markedly continental climate, but was occasionally found, as now, on better sites on isolated gneiss outcrops. Its introduction cannot be recommended, but an extension of Fir should be possible and beneficial.

2625. MRÁZ, K., and PACLTOVÁ, B. Pylová analysa rašelin a půd jako pomůcka při řešení aktuálních pěstebních otázek. [**Pollen analysis of peats and soils for the solution of important silvicultural problems.**] *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 29 (1), 1956 (3–20). 24 refs. [Cz.cz.russ.g.]

A survey of papers (German, French, Czech and Hungarian) dealing with this subject and published since 1936. The results of recent investigations by the authors (analysis of humous and mineral soils) and their comparison with the data available from literature show that Scamoni's modification of pollen analysis (*Waldkundliche Untersuchungen auf grundwassernahen Talsanden*, Berlin, 1950) can provide answers to the following questions: (1) How has the composition of certain forest types developed, and what was the natural composition in the past, when the climate was not appreciably different from today? (2) How has the composition of certain site types reacted to human interference? (3) What was the development of site conditions (soil in particular), especially after interference by man? (4) How have the present species (or mixture of species), established themselves, particularly when the site is unsuitable?

2626. SVATKOV, N. M. Sledy smeščenija granicy drevesnoĭ rastiteljnosti na Oloneksko-Lenskom vodorazdele. [**Traces of a shift of the northern tree limit on the Olonek-Lena watershed.**] *Bot. Ž.* 41 (10), 1956 (1488–90). 4 refs. [Russ.]

Boles of *Larix dahurica* 6–7 m. long were found in a river bed 2–3 km. north of the present limit for Larch and 200 km. north of living trees of the same size. They are thought to have been preserved in a bed of frozen river alluvium and recently brought to the surface by erosion.

2627. BOGOLEPOV, K. V. K istorii razvitija tretičnoĭ rastiteljnosti v nižnem Priangarje. [**The history of the development of Tertiary vegetation in the lower reaches of the Angara river.**] *Bot. Ž.* 41 (11), 1956 (1662–7). 8 refs. [Russ.]

Pollen analyses show that the succession between the Oligocene and Pliocene periods was from broad-leaved/coniferous forests, rich in species and including relict tree ferns, in the Oak/Holly and Chestnut horizons, to Alder and Birch with Pine, eventually replaced by meadow and *Stipa* steppes.

2628. ABUZJAROVA, R. JA. Sporovo-pyljcevye kompleksy èocenovyh otloženiĭ Turkmenii (Badhyza). [**Spore and pollen complexes of Eocene deposits in Turkmenia (Badkhyz).**] *Bot. Ž.* 41 (9), 1956 (1339–45). 10 refs. [Russ.]

The 14 families recorded include some subtropical and tropical genera. This confirms the theory that the subtropical to tropical flora of the Poltava region existed here during the Eocene, but the data also show that elements of the Turgai flora (Betulaceae, Juglandaceae) were present as well.

182.2. Succession, Alternation and Periodicity in Vegetation

See also Nos. 2459, 2645, 2687.

2629. PLOCHMANN, R. Bestockungsaufbau und Baumartenwandel nordischer Urwälder, dargestellt an Beispielen aus Nordwestalberta, Kanada. [**Structure and tree succession in northern virgin forests, based on examples from N.W. Alberta.**] *Forstwiss. Forsch.* No. 6, 1956. pp. 96. 90 refs. [G.g.e.*e.*] Price *DM*.12·50.

An evaluation of cruising data from 560 sample plots N. of lat. 57°, obtained by the author when engaged on survey work for the Department of Land and Forests, Alberta. He describes the main forest vegetation types on mineral and organic soils, dealing more particularly with the climax Spruce/Poplar/Fir forest on mineral soils, and the composition, structure, volume etc. of its juvenile, mature, and senescent stages. The recolonization of burned areas, and the succession leading back to the climax forest in one or more generations is traced for dry, fresh, and wet sites.

2630. HORTON, K. W. **The ecology of Lodgepole Pine in Alberta and its role in forest succession.** *Tech. Note For. Br. Can.* No. 45, 1956. pp. 29. 16 refs.

Four phytogeographical zones are recognized: (*a*) montane, (*b*) subalpine, (*c*) high foothills, (*d*) low foothills. Fire is stressed as the primary historical factor determining forest composition and sucession in this region. In (*d*), where mixed woods prevail, very few stands have escaped fire for more than 100 years and succession is unimportant; Lodgepole Pine and Aspen compete as pioneers. In (*a*), (*b*) and (*c*) Pine has expanded to general dominance through the frequency of fire, but the rougher terrain has provided refugia for residual older stands which give evidence of succession and are a seed source for the dispersal of Spruce [*Picea engelmannii, P. glauca, P. mariana*] and Alpine Fir [*Abies lasiocarpa*] into the adjoining young Pine stands. The succession from Pine to Spruce/Fir varies with the abundance and vigour of the climax species, the initial density of Pine, and the site. Pine persists longer on the drier sites. In (*b*) and (*c*), succession from Pine was complete by 290 years on the average, varying from 225 to 375 years. *From author's summary.*

2631. BILLINGS, W. D., and MARK, A. F. **Factors involved in the persistence of montane treeless balds [in the southern Appalachian Mountains].** *Ecology* 38 (1), 1957 (140–2). 7 refs.

It is concluded that these non-forested grassy areas occur on the margins of tolerance or between the upper limit of one species and the lower one of another, and that, once formed by fire, felling etc., they persist because the habitat so created is more severe than that of the forest for most tree seedlings. It is possible that Spruce may be very slowly colonizing some balds which lie just below its lower altitudinal limits.

2632. MCVAUGH, R. **Establishment of vegetation on sand flats along the Hudson River, New York, II. The period 1945–1955.** *Ecology* 38 (1), 1957 (23–9). 2 refs.

The woody species now most abundant under the Cottonwoods that became established early, are those that have fleshy or juicy fruits that could have been distributed by birds; the next most abundant are those with wind-borne samaras or cotton-tufted seeds.

2633. MCINTOSH, R. P. **The York Woods, a case history of forest succession in Southern Wisconsin.** *Ecology* 38 (1), 1957 (29–37). 10 refs.

This study was made to examine the distribution and interrelations, in one area, of species usually regarded as characteristic of pioneer Oak stands, with other species thought of as characteristic of climax Maple/Basswood stands. A grid of 60 quadrats was used to sample trees over 4 in. d.b.h., each of these quadrats containing 10 smaller quadrats to sample herbaceous species. Soil depth, field moisture capacity, pH, exchangeable Ca of the A_1 layer, and light intensity were determined in each of the large quadrats. On the basis of the interrelations of tree and subordinate species as indicated by Cole's Index of Interspecific Association, it is suggested that the diverse forest elements found are best interpreted as a pattern of species and that separation into two or more discrete communities must be arbitrary. *From author's summary.*

2634. AUNG DIN, U. **Problem of invasive evergreen forests (ecology).** *Proc. 8th silv. Conf., Dehra Dun 1951*, Part 2, 1956 (252–3).

Describes the development of Burmese moist deciduous Teak-bearing forest to evergreen forest—a natural process accelerated by fire exclusion and selective Teak working.

182.4. Layer Communities

See also Nos. 2431, 2640.

2635. COLEMAN, B. B., MUENSCHER, W. C., and CHARLES, D. R. **A distributional study of epiphytic plants of the Olympic Peninsula, Washington.** *Amer. Midl. Nat.* 56 (1), 1956 (54–87). 5 refs. B.A.P.

A study of lichens, liverworts, mosses, lycopsids and ferns found on 43 species of conifers, hardwoods and shrubs at 20 stations in 6 types of environment.

2636. ṢĀBATĪ, H. Challar wa chalarak. [***Fagus sylvatica* and *Epimedium pinnatum*.**] *Mon. Bull. Iran. For. Serv.* 7 (5), 1956 (11–8). [Per.]

Some observations on plant indicators of Beech forests and sites in Persia, of which *E. pinnatum* is so characteristic that the local people call it the 'little beech' (*chalarak*); others are *Asperula odorata, Fragaria vesca, Lamium galeobdolon, Calamintha grandiflora, Neottia nidus-avis, Lathraea squamaria, Dentaria bulbifera*, and *Sanicula europaea*. Reference is also made to the conflicting pronouncements of botanists (e.g. Lipsky, Schwarz, Rol) on the existence of *Fagus orientalis* and *F. sylvatica* var. *macrophylla* in various parts of Iran, and the likelihood, in the author's opinion, that all specimens collected are merely divergent forms of true Beech. *Carpinus betulus* in Persia also differs markedly in leaf shape, bark etc. from the typical European Hornbeam; both

it and Beech need further study, based on material representative of their full range in Persia.

182.5. Synecological Measurements and Methods

See also Nos. 3172, 3190.

2637. PURI, G. S. **The transect method in the study of plant communities in India.** *Proc. 8th silv. Conf., Dehra Dun 1951*, Part 2, 1956 (409–13). 31 refs.

Describes the transect method of studying vegetation, and recommends its use in India, where there is need of a simple field method to stimulate vegetation studies.

2638. HÜRLIMANN, H. Die Untersuchung der Struktur tropischer Wälder. **[Structure analyses in tropical forests.]** *Bericht über das geobotanische Forschungsinstitut Rübel in Zürich 1953*, 1954 (49–53). 6 refs. [G.] A.P.B.

Outlines a method of analysis of small units of vegetation adapted from E. Schmid, concentrating on mapping the area under investigation, recording numbers and growth patterns (including heights) and ecological characteristics of plants and their spatial distribution.

2639. MRÁZ, K. Fytocenologická synthesa za použití statistických strojů. **[Use of statistical machines for the synthesis of plant-sociological data.]** *Sborn. čsl. Akad. zeměd. (Lesn.)* 29 (11), 1956 (813–24). 36 refs. [Cz.cz.russ.g.*russ.g.*]

Recommends the use of punched cards (one card per species) with 90 columns of 10 places each; 67 columns provide general data on the survey, such as: surveyor; month; economic productivity of stand; composition of the tree storey; configuration; slope; aspect; altitude; parent materials; depth of water-table; depth, fertility, moisture content and origin of the soil; humus; soil type; macro- and microclimates; developmental stage and density of individual plant layers. The remaining columns are reserved for the species in question, under the following heads: species serial number: subspecies; plant layer; vitality; stage of development; uniformity of distribution; and dominance. The last column of all makes it possible to evaluate the number of cases in which a certain species occurs in a certain developmental stage of a certain phytocoenosis.

187. Vegetation Types

See also Nos. 2403, 2427–8, 2429, 2432, 2620–2, 2629–36, 2667, 3191, 3601.

2640. KREEB, K. Phänologisch-pflanzensoziologische Untersuchungen in einem Eichen-Hainbuchenwald im Neckargebiet. **[Phenological and plant-sociological investigations in an Oak/Hornbeam stand in the Neckar region.]** *Ber. dtsch. bot. Ges.* 69 (8), 1956 (361–74). 10 refs. [G.] O.B.D.

Plots on (1) a N.N.E., and (2) a S.S.W. aspect were sampled for species composition by Braun-Blanquet's method and at the same time phenological observations were made on leaves and flowers. Diagrams show the relative development of the vegetation in 2 successive years according to the number of species in (*a*) the ground flora, (*b*) the understorey, (*c*) the upper storey and (*d*) the whole stand. The differences in the 2 aspects and the usefulness of the findings are discussed.

2641. RÜHL, A. Über die linksrheinischen wärmeliebenden Trockenwälder. **[The thermophilous dry forests on the left banks of the Rhine.]** *Allg. Forst- u. Jagdztg.* 127 (11/12), 1956 (221–6). 22 refs. [G.e.]

A plant-sociological study of dry Oak forests, chiefly on siliceous formations of the Middle Rhine and Moselle, dry Beech forest on calcareous soils, and the Pine 'steppe' woodlands of the Mainz region, describing soil and site conditions, vegetation and yields of main species for various sub-communities.

2642. RÜHL, A. Über die Vegetationsverhältnisse der Wälder in den Kalkgebieten Nordrhein-Westfalen. **[The vegetation of the forests of the limestone areas of Nordrhein-Westfalen.]** *Forsch. u. Berat. (Forstw.) Landesaussch. landw. Forsch. Landes Nordrhein-Westfalen* No. 2, 1956 (41–6). 12 refs. [G.]

Covers parts of the Weser mountain region, including the Teutoburger Wald, parts of the Sauerland, and the Kalkeifel, comparing the influence of geographical position and climate on the composition of plant communities, chiefly types of Beech forest.

2643. SCAMONI, A. Das *Melico-Fagetum* im baltischen Buchenmischwald. **[The *Melico-Fagetum* in the Baltic mixed Beech forest.]** *Forstarchiv* 27 (3), 1956 (55–9). 22 refs. [G.g.]

A study was made of the *Melico-Fagetum* in Mecklenburg and Uckermark and a tabulated description, by layers, is given of its structure. The difference in species composition from other Baltic mixed Beech forests is discussed. Three forms of *Melico-Fagetum balticum* are distinguished; eastern, sub-atlantic and S. Swedish.

2644. HARTMANN, F. K. Waldgesellschaften der Bergmischwaldstufe aus dem bayerischen Randalpengebiet in ihrem Aufbau und ihrer waldbaulichen Bedeutung. **[Forest plant communities of the montane mixed-forest zone of the Alpine borderland of Bavaria, their structure and silvicultural significance.]** *Forstarchiv* 27 (3), 1956 (48–55). 6 refs. [G.]

The climatic, edaphic and topographical features of the Bavarian Alps are examined and compared with those of the central mountains of Germany. The plant communities *Acereto-Fagetum* and *Fagetum boreoalpinum* are described and compared in tabular form. Some silvicultural recommendations are made.

2645. SAXER, A. Die *Fagus-Abies-* und *Picea*-gürtelarten in der Kontaktzone der Tannen- und Fichtenwälder der Schweiz. **[The species of the *Fagus/Abies* and *Picea* zones where the Fir and Spruce forests meet in Switzerland.]** *Beitr. geobot. Landesaufn. Schweiz* No. 36, 1955. pp. 198. 200 refs. [G.g.]

A detailed floristic-ecological analysis based on the methods of E. Schmid [cf. *F.A* 12 No. 2750], chiefly of existing, and sometimes virgin, Fir

forests in the Swiss Alps. The author concludes that these belong to the Fir/Beech zone. Transition to the Spruce zone proceeds not gradually, but in a mosaic pattern. Three biocoenotic types of Fir forest are distinguished, which correspond quite well to Kuoch's classifications on Braun-Blanquet lines [cf. *F.A.* 16 No. 299.]

2646. KUOCH, R. Zur Systematik von Tannenwäldern. [**The classification of Fir forests.**] *Schweiz. Z. Forstw.* 108 (2), 1957 (113–21). 1 ref. [G.]

A critical review of A. Saxer's paper [see preceding abstract], comparing the classification principles of the Braun-Blanquet School with those of E. Schmid as employed by Saxer and, in general, finding many points of agreement and correspondence. [Cf. *F.A.* 16 No. 299.]

2647. GROSSER, K. H. Waldvegetation und forstlicher Standort in der Oberlausitzer Heide. [**Forest vegetation and forest site in the Oberlausitz Heath.**] *Arch. Forstw.* 5 (5/6), 1956 (423–30). 9 refs. [G.g.]

Describes 13 plant groups, associated in vegetation, but especially informative for the interpretation of site factors in the site mosaic of the area. A diagram shows the inter-relation of these groups with vegetation associated with decreasing moisture and fertility. The types chiefly concerned are Pine/mixed forest, Spruce/Pine, Pedunculate Oak/Birch, Aspen/Birch, running from dry heath forest to marsh and bog.

2648. GROSSER, K. H. Die Vegetationsverhältnisse an den Areal-Vorposten der Fichte im Lausitzer Flachland. [**Vegetation relations in the outliers of the natural range of Spruce in the Lausitz Plain.**] *Arch. Forstw.* 5 (3/4), 1956 (258–95). 31 refs. [G.g.]

Gives vegetation data for 17 outliers of the lower Lausitz, and a comprehensive association table for the Spruce/Pine of Upper and Lower Lausitz. These outliers are regarded as outposts of the Hercynian-Carpathian Spruce distribution. The study covers the original site of the local climatic race of late-flushing 'Niederlausitzer Tieflandfichte'.

2649. PASSARGE, H. Vegetationskundliche Untersuchungen in Wäldern und Gehölzen der Elbaue. [**The vegetation of the forests and woodlands of the Elbe floodland.**] *Arch. Forstw.* 5 (5/6), 1956 (339–58). 16 refs. [G.g.]

As an addendum to his earlier studies [see *F.A.* 16 No. 287] the author describes, with association tables, the *Fraxino-Ulmetum medioeuropaeum* at Wörlitz and Havelberg [70 miles S.W. and N.W. of Berlin]. A constancy table summarizes data for bottomland forests of the Danube, Upper Rhine, Hungary, the Saone and the Elbe, those of the last being distinguished by the absence of Mediterranean species (Privet, *Populus nigra*, Ivy and Clematis). The silvicultural possibilities of the Willow, Poplar, and the 'hardwood' Oak/Elm zones, and the area % of forest, water meadow and arable between stream and dyke, are given for 3 reaches. The 'hardwood' forests are separated climatically along the Elbe by optima for Ash, *Ulmus carpinifolia*, and *U. laevis*.

2650. MIKYŠKA, R. Fytosociologická studie lesů terasového území v dolních částech povodí Orlice a Loučné. [**Plant-sociological investigation of forests on the terraces of the lower flood-plains of Orlica and Loučna rivers.**] *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 29 (5), 1956 (313–70 + 6 tbls. + 1 map). 84 refs. [Cz.cz.russ.g.*g.*]

A detailed study of this area (E.Bohemia). The main unions, *Quercion roboris-sessiliflorae*, *Fagion sylvaticae*, and *Alneto-Ulmion*, are described in detail with tables and a map. The German summary runs to 7 pages.

2651. MARTINOLI, G. La *Quercus coccifera* L. var. *imbricata* DC. in Sardegna e suo significato fitogeografico. [***Q. coccifera* var. *imbricata* in Sardinia, and its ecological significance.**] *Nuovo G. bot. ital.* (*n.s.*) 60 (3), 1953 (1954), (518–64 + 4 photos). [It.it.g.] A.P.B.

2652. BRAUN-BLANQUET, J., SILVA, A. R. PINTO DA, and ROZEIRA, A. Résultats de deux excursions géobotaniques à travers le Portugal septentrional et moyen. II. Chênaies à feuilles caduques (*Quercion occidentale*) et chênaies à feuilles persistantes (*Quercion fagineae*) au Portugal. [**Results of two geobotanical excursions across northern and central Portugal. II. Deciduous Oak woods (*Quercion occidentale*) and evergreen Oak woods (*Quercion fagineae*) in Portugal.**] *Agron. lusit.* 18 (3), 1956 (167–234 + 5 plates + 6 tbls.). 38 refs. [F.g.]

2653. RITTER-STUDNICKA, H. Beitrag zur Ökologie der Serpentinflora in Bosnien. [**The ecology of the serpentine flora in Bosnia.**] *Vegetatio* 7 (2), 1956 (89–98). 14 refs. [G.] A.P.B.

A survey of the soils and vegetation of this geological formation of Bosnia.

2654. PURI, G. S. **Proposed forest-types studies in India.** *Proc. 8th silv. Conf., Dehra Dun 1951*, Part 2, 1956 (551–3). 25 refs.

A brief historical review of forest typology, from Cajander to Champion, tending to the view that Heimburger's system is most suited to Indian conditions and could be accommodated in Champion's larger groups. A programme is outlined for the work involved.

2655. SCHMID, E. Beiträge zur Flora und Vegetation der Kanarischen Inseln. [**Contributions to the flora and vegetation of the Canary Is.**] *Bericht über das geobotanische Forschungsinstitut Rübel in Zürich 1953*, 1954 (28–49 + 8 photos). 20 refs. [G.] A.P.B.

A plant-geographical and plant-sociological analysis, including the original *Laurus* and *Erica arborea* forests. The author describes the peculiar growth form of the species in the former, e.g. *Laurus canariensis* and *Ilex canariensis*, which resemble giant bushes with numerous stems.

2656. AUBRÉVILLE, A. Accord à Yangambi sur la nomenclature des types africains de végétation. [**Agreement at Yangambi on the nomenclature of African vegetation types.**] *Bois For. Trop.* No. 51, 1957 (23–7). [F.]

Briefly outlines the discussions and the main heads of agreement, giving French and English terms for the main types, with definitions. [For a general notice of the conference see *F.A.* 18 No. 1397.]

2657. AUBRÉVILLE, A. Échos du Congo Belge. **[News items from the Belgian Congo.]** *Bois For. Trop.* No. 51, 1957 (28–39). [F.]

Gives some account of the moist forest of the Congo basin and the woodland of the Katanga plateau, and discusses the origin of the giant fossil termitaries and the patches of dense forest that occur in the latter.

2658. CLOVIS, J. F. **Ecological association types in the Italy Hill (N.Y.) [virgin forest] swamp area.** *Abstr. of thesis*, in *Dissert Abstr.* 16 (5), 1956 (850–1). O.R.S.

The swamp forest is the largest uniform type in the area; species are characteristic of the Hemlock/Yellow Birch/Red Maple swamp forest type in the Hemlock/White Pine/Northern hardwoods forest region. The mesophytic woods type, made up of many small units, with climax in the Great Lakes Maple/Beech type, is the next largest.

2659. KUCERA, C. L., and MCDERMOTT, R. E. **Sugar Maple—Basswood studies in the forest-prairie transition of Central Missouri.** *Amer. Midl. Nat.* 54 (2), 1955 (495–503). 11 refs. B.A.P. [Cf. *F.A.* 16 No. 1566.]

2660. TOMASELLI, R. Foreste, praterie e deserte degli Stati Uniti centro-meridionali dalla costa atlantica a quella pacifica. **[Forests, prairies and deserts of the south-central United States from the Atlantic to the Pacific coast.]** *Ann. Sper. agr.* (*n.s.*) 11 (1), 1957: Suppl. pp. cix-cli. [It.] C.G.B.

Describes the principal vegetation types from Lower California to Virginia and Florida.

2661. NELSON, T. C., ROSS, R. D., and WALKER, G. D. **The extent of moist sites in the Georgia Piedmont and their forest associations.** *Res. Note Stheast. For. Exp. Sta.* No. 102, 1957. pp. 2. 3 refs.

Lists 4 cove and 6 bottomland associations, with notes on quality of timber, growth rates etc. and their classification under the forest cover types of the Society of American Foresters [cf. *F.A.* 15 No. 3382]. Moist sites occupy ca. 18% of the forest land of the region, about ½ being cove sites on valley slopes. The moist sites are considered the most promising for profitable hardwood management.

2662. SHARPE, G. W. **A taxonomical-ecological study of the vegetation by habitats in eight forest types of the Olympic rain forest, Olympic National Park, Washington.** *Abstr. of thesis*, in *Dissert. Abstr.* 16 (6), 1956 (1043). O.R.S.

In a 4-year study, 176 ten-thousand-sq.-ft. plots were established in 8 pure forest types. All vegetation was recorded within each plot. The thesis includes precipitation and temperature charts, soil analysis tables and epiphyte charts for two fallen conifers.

2663. WALLMO, O. C. **Vegetation of the Huachuca Mountains, Arizona.** *Amer. Midl. Nat.* 54 (2), 1955 (466–80). 21 refs. B.A.P.

Describes (1) the desert scrub and grassland zone (below 5000 ft.), (2) the encinal zone (above 5000 ft.), and (3) the forest zone (above 7000 ft.). The forest zone consists of Pine/Douglas Fir/Oak forest, Pine/Fir forest and Aspen forest.

2664. SOSA HERRERÍAS, A. Bosques de Michoacán. **[Forests of Michoacán [Mexico].]** *Mensajero for., Durango* No. 147, 1956 (4–5, 25–7). [Span.]

Notes, based on a general tour of 3 areas, on the geology and soils (mainly volcanic), the topography and the forest vegetation of the state. The distribution of Pines is summarized as: *P. leiophylla* in its climax tends to almost pure consocies in the centre and east at mean altitudes of 2000 m. on basalt-derived soils in gentle topography. *P. michoacana* at its optimum forms associes in the truly mountainous eastern parts (2500–2700 m.). *P. montezumae* is a dominant in association with *Abies religiosa* in the central and higher regions (2800–3000 m.).

2665. LÖTSCHERT, W. Die Mangrove von El Salvador. **[The mangroves of San Salvador.]** *Umschau, Frankfurt am Main* 55 (2), 1955 (47–50). [G.] L.S.

An illustrated description of mangrove vegetation in the Rio Lempo delta, mentioning *Laguncularia racemosa*, *Avicennia nitida*, *Conocarpus erecta* and *Rhizophora mangle* and their ecological requirements etc.

2. SILVICULTURE

See also Nos. 2562, 2567, 2570–1, 3601.

2666. FRASER, H. **Forest preservation in the Windward Islands.** *Carib. For.* 17 (1/2), 1956 (25–8).

A note on the local value of forests with recommendations for their treatment. Drier lower areas carrying dense bush should be worked as coppice (10-year rotation) with standards (50 years) retaining the valuable *Tabebuia pallida* and the *Albizzia caribaea* at 30 × 30 ft. for timber. Teak is best for the open land with poorer vegetation and *Cassia siamea* as 10-year coppice for fuel.

2667. THORNTON, P. L. **Problems of managing Upper Michigan's coniferous swamps.** *J. For.* 55 (3), 1957 (192–7). 17 refs.

Describes briefly the species composition and site conditions of the main forest types in the coniferous swamps. Satisfactory regeneration of the desired species is the main difficulty in management, as the % of inferior hardwoods increases on all sites after felling [cf. *F.A.* 14 No. 2088]. On ca. 25% of the swamp forests no natural re-stocking is observed, and artificial regeneration is necessary if the land is to remain productive. The most important insect enemies are the Spruce budworm and the Larch

sawfly; much of the swamp area can only be converted to valuable species if epidemics of the sawfly can be controlled. Considerable loss of volume is caused by rots, of which the main ones are: *Poria subacida*, *Stereum sanguinolentum* and *Polyporus balsameus*; sanitation fellings and early harvesting of Balsam Fir can reduce losses. Swamp drainage will accelerate tree growth on very wet sites but its cost is often prohibitive.

2668. KREIDLER, H. Die bisherige und künftige Bewirtschaftung der Weisstanne im Forstbezirk Tuttlingen (Südwestalb). [**Past and future management of Silver Fir in the Tuttlingen forest district.**] *Allg. Forst- u. Jagdztg.* 127 (10), 1956 (212–20). 4 refs. [G.g.e.]

A critical discussion of Baumgarten's article [see *F.A.* 18 No. 1355], expressing the view that the district is just outside the natural range of Fir (chiefly because of its drier climate) but that it should be possible to retain the species by suitable regeneration techniques and tending, particularly under irregular shelterwood and wedge systems.

2669. POMEROY, K. B., and COOPER, R. W. **Growing Slash Pine.** *Fmrs'. Bull. U.S. Dep. Agric.* No. 2103, 1956. pp. 28. 5 refs.

General information on silviculture, protection and utilization (including resin tapping) of *Pinus elliottii*.

2670. ERNST, W., JR. **A new day for Pond Pine.** *For. Fmr.* 16 (4), 1957 (8–9, 15–7).

Discusses the management of *Pinus serotina* in the coastal regions of N. and S. Carolina, with reference to fire protection, water-table control, harvesting and regeneration. The author stresses the need for encouraging natural regeneration, developing a good access-road system and improved logging techniques on wet sites.

22. Silvicultural Systems. Constitution and Composition of Stands; Forms of Stand

221. High Forest Systems

See also Nos. 2462, 2689, 2693–6, 2700, 3224.

2671. MIKOLA, P. Hakkuu—asento—uudistusmenetelmä. [**Felling—stage [of felling]—method of regeneration.**] *Metsät. Aikak.* 1956 (8), (243–9). [Fi.e.]

Distinguishes between the various [Finnish] terms [giving English and German equivalents] and discusses the nomenclature of regeneration systems. These can be shown in graphs, with the age of the stand on the abscissa and the number of stems/ha. on the ordinate. Fellings are indicated by the reduction in number of stems, and between fellings, when the number remains constant, the stand is said to be in a certain stage, e.g. the seed-tree or shelterwood stage. *From author's summary.*

2672. GREGORY, R. A. **The effect of clearcutting and soil disturbance on temperatures near the soil surface in southeast Alaska.** [Alaska Forest Research Center, Juneau.] [1956?] pp. 22. 17 refs.

[Cf. *F.A.* 17 No. 13.] Measurements were made in the forest and in a clear-felled area, on plots with undisturbed moss cover or where the organic and mineral soils had been mixed. Air and soil temperatures were considerably increased during late spring and summer as a result of felling. Open soils warmed earlier, and cooled earlier and more rapidly, than forested soils, and the difference in soil temperature was still appreciable at a depth of 24 in. No injury to seedlings from excessive heat or frost was observed. Moss-covered seedbeds proved less desirable than disturbed soils for germination and early survival, but once seedling roots were established in the moist layers below the moss, chance of survival seemed good. Germination in disturbed soils was earlier and more concentrated. Germination in the forest was late and prolonged, and seedlings were still in the succulent stage at the end of the growing season. Sitka Spruce was most abundant, Western Hemlock least abundant and Western Red Cedar intermediate, on the seedbeds.

2673. ROE, A. L. **Cutting practices in Montana Larch-Douglas Fir.** *Northw. Sci.* 29 (1), 1955 (23–34). 8 refs. L.S.

Describes four harvest-cutting methods applied on a pilot scale (40–100 acres), chiefly in the Coram experimental forest, Montana: (1) shelterwood cutting (vigour selection); (2) shelterwood cutting (economic selection); (3) seed-tree cuttings; and (4) block or patch clear-cutting. As far as seed supply for regeneration is concerned (1) and (2) were found to produce 2–5 times as many first-year seedlings as (3). Tables give data on the number of first-year seedlings per acre, by slash-disposal treatment and cutting method, for *Larix occidentalis* and other species (mostly *Pseudotsuga taxifolia* var. *glauca*); growth of residual stands per acre, by cutting method; and distribution of residual trees by vigour class. The merits of the 4 methods are discussed.

2674. REINKE, M. E. **Management of Aspen.** *Wis. Conserv. Bull.* 20 (11), 1955 (25–8). B.A.P.

Recommends clear felling for Aspen (both Bigtooth and Trembling Aspen) at maturity, which is reached in Wisconsin Stands at ca. 40–50 years. Yields vary from 5 to 25 cords/acre depending on the soil moisture and fire history of the stand.

2675. HENRY, P. W. T. **Development of the regeneration obtained by the tropical shelterwood system when applied as a pre-exploitation treatment only.** *Inform. Bull. For. Dep. Nigeria* No. 40, 1956. pp. 3. 3 refs.

A descriptive note in which regeneration counts (16 species) are compared for 1946, when 1040 trees (30 species, 218,669 H.ft.) were removed from 1338 acres, and for 1956, by which time regeneration had lifted and penetrated the general climber tangle, no cultural operations having been done. Regeneration was of good form and gave an encouraging indication of the effectiveness of the system.

2676. ERTELD. Über die saumweise Verjüngung der Buche. [**On strip regeneration of Beech.**] *Forst- u. Holzw.* 12 (3), 1957 (38–41). [G.]

Describes practical experience with a strip regeneration system in medium-quality 110- to 125-year Beech on greywacke, near Trier, at first using strips 25–30 m. wide, later 40–60 m. The disadvantages of this system, e.g. injury along the border of the unfelled stand and the impossibility of fencing, are considered to be less than those of the classical shelterwood system.

2677. HASSENKAMP, W. Das Scheitern der Plenterwirtschaft in Skandinavien. [**The failure of the selection system in Scandinavia.**] *Forstarchiv* 26 (11), 1955 (241–51). 33 refs. [G.]

Discusses forest policy in Scandinavia over the past 50 years with particular reference to *Pinus sylvestris* forest in Norrland and the failure of natural regeneration under selection fellings. Only clear felling followed by slash burning and planting have ensured satisfactory regeneration.

2678. SCHAEFFER, A., GAZIN, A., and ALVERNY, A. D'. **Sapinières (Silver Fir stands): selection working by area (check method by means of curves).** *Bull. For. Dep. Univ. Edinb.* No. 3, 1957. pp. 52.

Transl. by M. L. Anderson of a paper first published in France in 1930.

2679. STEWART, M. **Cost study of partial cutting treatments in interior wet belt of British Columbia.** *Res. Note B.C. For. Serv.* No. 32, 1956. pp. 22.

A study was made of comparative costs of different types of selective felling in mixed stands (45·8% *Pseudotsuga taxifolia*, 20% *Thuja plicata*, 13·4% *Larix occidentalis*, 13·4% *Pinus monticola*, 5·6% *Picea engelmannii* and 1·8% *Tsuga heterophylla*). The felling methods were as follows: (1) cutting *T. plicata* to 12-in. diameter limit and all other species to 19 in.; (2) as (1) but *P. monticola* to 16 in.; (3) as (1) but cutting *P. monticola* with reference to spacing, vigour etc.; (4) cutting *T. plicata* as in (1), *P. monticola* to 16 in., and all other species to 14 in. d.b.h.; (5) cutting *T. plicata* as in (1) and all other species with reference to spacing, vigour etc.; (6) cutting *T. plicata* as in (1) plus low thinning of all other species; (7) cutting all species to 12 in. d.b.h. Treatment (4), which is in common use, was shown to give maximum return for costs; (1) caused an increase of 16% in the % ratio of production costs to value of product, and (5), which removed about the same volume as (1), caused a still greater increase 35%, and (6) caused a similar increase. Lowering the diameter limit to 12 in. for all species (treatment 7) barely affected the ratio.

2680. EHRHART, E. O. **A plateau in forest management for pulpwood in the northern hardwood forest [of Canada].** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1550 (F-1), 1956. pp. 4 + 9. 2 refs.

A paper and panel discussion on a large-scale application to second-growth Cherry/Maple/Beech (for pulpwood and veneer) of a 15-year felling cycle, with 8 in. min. diam. and reserve marking of 20 crop trees/acre. Yield and stand tables, a schedule of works and data on man-hours/cord by diameter classes for felling, trimming and peeling, and cross-cutting and stacking the chemically peeled pulpwood are given.

222. Coppice, Pollarding and Lopping Systems

See also Nos. 2666, 2684.

2681. **Utilisation of Hazel coppice.** *Bull. For. Comm., Lond.* No. 27, 1956. pp. 34 + 1 specimen sheet + 32 plates. Price 10*s*.

Presents the results of studies, in which many agencies cooperated, on the rate of growth and yield of coppices of the common Hazel, and on the utilization of Hazel poles both by traditional methods and by modern technical processes. As Hazel occupies over 160,000 acres of woodland in Great Britain, its proper utilization, where this is economically feasible, is a matter of concern to owners of woodlands. In other circumstances, the use of the land it occupies (often of high quality) for some alternative form of forestry, may have to be considered. The following chapters are included: (1) Distribution and extent of Hazel in British woodlands; (2) Management and utilization of Hazel coppice (*C. B. Durham*); (3) The Hazel underwood industry (*W. G. Trust*); (4) The yield of Hazel coppice (*J. N. R. Jeffers*); (5) New uses for Hazel coppice: (i) Hardboard (*G. J. Roach*), (ii) Paper (*R. S. Jobin*). There are appendixes on methods of calculating yield and descriptions of sites.

2682. ALVES, A. A. MONTEIRO. Aspectos económicos da exploração do castanheiro em talhadia. [**Economic aspects of managing Chestnut on a coppice system.**] *Agros* 40 (1), 1957 (22–47). 12 refs. [Port.]

Discusses the advantages of coppice systems with particular reference to Chestnut, reviews practices in various regions of Portugal and presents data on the production and economics of a Chestnut stand at Chão de Couce, managed on an 18-year rotation.

2683. RABOUILLE, G. Le problème des taillis sous futaie de l'est vu sous l'angle de production de bois à pâte. [**The problem of coppice with standards in Eastern France from the point of view of pulpwood production.**] *Rev. for. franç.* 9 (2), 1957 (106–12). [F.]

Calculates the costs, labour requirements, and probable yields, involved in the conversion to coniferous pulpwood stands of some of the great extent of uneconomic coppice-with-standards in Eastern France.

226. Changes of Silvicultural System. Conversion (by System or Species)

See also Nos. 2683, 2826.

2684. STEPHAN. Einhundertacht Jahre Waldbau auf Lösslehm im Thüringischen Forstamt Wilchwitz-Kraschwitz (1838 bis 1946). [**One hundred and eight years of forestry on loess-loam in the Thuringian forest district of Wilchwitz-Kraschwitz.**] *Forst u. Jagd* 5 (9; 10) 1955 (385–7; 425–8). [G.]

Describes the conversion, early in the 19th century, of most of the originally mixed hardwood forest, managed as coppice-with-standards, to Spruce, Pine and pure Oak (all rather unsatisfactory), and the partial reconversion, still in its initial stages, to mixed hardwoods, including methods of establishment.

2685. SHIOYA, T., and OHIRA, E. **[Economic studies on conversion [of fuel forest into timber forest] under private ownership.]** *For. [industr.] Econ., Tokyo* 9 (9; 10), 1956 (4–15; 16–23, 8). 21 refs. [Jap.jap.]

A case-study of a mountain village in N. Kyushu, the main outturn of whose forests has been converted from fuel to timber. The methods of working and course of conversion are described, and the attendant economic problems, particularly that of capital investment, discussed.

228. Constitution and Composition of Stands; Choice of Species and Form of Mixture; Tree Classes; Forms of Stand

See also Nos. 2404–5, 2408, 2841, 2851, 2953, 2960, 3206.

2686. HOFMANN, G. Zur Frage der Holzartenwahl auf Südthüringer Wellenkalkböden. **[Choice of species for lower Triassic shell-limestone sites in S. Thuringia.]** *Forst u. Jagd* 5 (6), 1955 (253–4). 5 refs. [G.]

A description of the climate and the main site types. For N. slopes, enrichment of existing Beech forests with valuable hardwoods and with conifers, including exotics, is recommended; for the plateaux, mixed hardwoods with Larch and possibly Douglas Fir; for the shallow, stony S. slopes, Sessile Oak with *Sorbus torminalis*, or Austrian Pine.

2687. WECK, J. Entwicklungsstufen und Gefügetypen von Baumbeständen. **[Stages of development and types of stand structure.]** *Forstwiss. Cbl.* 75 (3/4), 1956 (108–24). 4 refs. [G.g.]

The biological production potential of a managed stand is the result of the interplay of natural factors and human intervention. A system and a key have been devised and are presented which enable the forester to estimate the characteristics of the stand and the direction and dynamics of its future development and so to draw up management plans. *From author's summary.*

2688. LIEBOLD, E. Die Anwendung der Stadientheorie in der Forstwirtschaft bei Pflegehieben. **[The application of the theory of life stages in tending operations.]** *Forst u. Jagd* 5 (10–12), 1955 (404–6; 451–3; 515–7). 18 refs. [G.]

An account of Lysenko's theory of life stages, and of Voropanov's tree-class system and methods of thinnings and increment felling based thereon [cf. *F.A.* 12 No. 99; 17 No. 407]. The author doubts its applicability to even-aged German Spruce stands, as the premature removal of the physiologically oldest, i.e. frequently the largest trees with the best crowns, would reduce gale and snow resistance, and though it might lead to increased volume increment, would not tend to yield maximum value. For selection forests the method is considered promising, but the difficulties of recognizing physiological age are stressed, and Voropanov's criterion, osmotic pressure, is not considered reliable.

2689. GOTHE, H. Kennzeichnende Lärchen-Mischbestockungen im Graf Görtzischen Forstamt Schlitz unter besonderer Berücksichtigung von Eiche und Tanne als Mischholzarten. **[Typical mixed Larch stands in the Schlitz district, with particular reference to Oak and Silver Fir as components.]** *Forstwiss. Cbl.* 74 (11/12), 1955 (365–79). 32 refs. [G.g.]

Compares the yield of mixed stands with that of pure stands and studies their ecological aspects. It is concluded that mixed stands should be managed on a shelterwood system.

23. Regeneration and Formation of Stands

See also No. 2425.

2690. KRISHNASWAMY, V. S. **Regeneration of evergreen and semi-evergreen forests.** *Proc. 8th silv. Conf., Dehra Dun 1951* Part 2, 1956 (299–302).

A review of current practices in different parts of India.

2691. SETH, S. K. **The problem of Sal regeneration in the Uttar Pradesh.** *Proc. 8th silv. Conf., Dehra Dun 1951*, Part 2, 1956 (272–8).

A detailed review of the position in each of the 8 Sal types (totalling 1,300,000 acres) in the U.P. reserved forests, with recommendations for future research [cf. *F.A.* 10 No. 2542].

231. Natural Regeneration

See also Nos. 2414, 2605, 2672–7, 2714, 2737, 2857, 2970.

2692. SETH, S. K. **Natural regeneration of Fir (*Abies pindrow*) and Spruce (*Picea morinda*) forest [in Uttar Pradesh].** *Proc. 8th silv. Conf., Dehra Dun 1951*, Part 2, 1956 (321–3).

No research has yet been undertaken on this subject, and the writer briefly describes the problems involved.

2693. QUAITE, J. **Survival of White Spruce seedlings resulting from scarification in a partially cut mixedwood stand.** *Tech. Note For. Br. Can.* No. 44, 1956. pp. 9. 7 refs.

Exposure of the mineral soil by scarification creates favourable conditions for establishment and survival of *Picea glauca* seedlings in the mixedwood region of Alberta, though it may not be successful on very wet sites. Scarified sites remain receptive for several years.

2694. SCHUBERT, G. H. **Early survival and growth of Sugar Pine [*Pinus lambertiana*] and White Fir [*Abies concolor*] in clear-cut openings.** *For. Res. Note Calif. For. Range Exp. Sta.* No. 117, 1956. pp. 6.

In summer 1948 overmature groups of mixed Sugar Pine/White Fir were clear-felled on the Stanislaus Experimental Forest, Sierra Nevada. Brush and White Fir seedlings were bulldozed off, and both clear-felled areas and buffer strips were treated with a lethal bait to reduce the rodent population. Seed traps and permanent milliacre quadrats were established to determine the effectiveness of natural seeding. During the autumn this averaged 29,000 Sugar Pine and 160,000 Fir seeds/acre over the clear-felled area. After 2 years Pine mortality was 45% and the Fir 73. Some Ponderosa and

Jeffrey Pine seedlings were also established. After 8 years Jeffrey Pine showed the most height growth, Fir the least. Late spring frost damaged the Fir more than the Sugar Pine except where sheltered by brush or Pines; the Fir was also more browsed by deer. If Fir is to be the main crop, initial overstorey shelter and no clear-felled openings are recommended. If Sugar Pine is to be the main crop in the Sugar Pine/Fir type, clear-felled openings will reduce the % of White Fir in the stand.

2695. BOE, K. N. **Regeneration and slash disposal in Lodgepole Pine clear cuttings.** *Northw. Sci.* 30 (1), 1956 (1–11). 3 refs. L.S.

Different logging and slash-disposal operations were employed in this study (Montana, alt. 6500–7100 ft., clay and silt-clay-loam soils of low to medium productivity) to create 7 kinds of seedbed. A 4-year record of seedling establishment on one clear-felling showed effective distribution of seed to be mainly on the margins of the cutting. The highest stocking was obtained for the following seedbeds: (1) skid road, (2) bulldozer-scarified, and (3) slash, lopped and scattered; a slightly lower figure for (4) forest floor, and very low figures for (5) slash, windrows and concentrations, (6) burnt, piled slash, and (7) burnt, windrows. [Cf. *F.A.* 13 (No. 1091.]

2696. TACKLE, D. **Stocking and seedbed distribution on clean-cut Lodgepole Pine areas in Utah.** *Res. Note Intermt. For. Range Exp. Sta.* No. 38, 1956. pp. 3. 3 refs.

In 1953 in the Uinta Mts., a tally of reproduction was made on milliacre plots of *Pinus contorta* which had been clear-felled in 1947 and the slash scattered, and left unburned. The highest % of stocking was on seedbeds of slash < 6 in. deep, then in disturbed duff, slash between 6 and 12 in. deep, and on disturbed mineral soil. These 4 types of seedbed occupied 76% of the total area and provided 91% of the total stocking. Seedbeds not conducive to seedling establishment were: slash > 12 in. deep, undisturbed soil or duff, grass and brush.

2697. MOULDS, F. R. **Monterey Pine [*Pinus radiata*] seedling establishment under varying conditions of crown cover and soil treatment.** *Aust. For.* 19 (2), 1955 (100–16). 5 refs.

Fully stocked stands of *Pinus radiata* exert a marked influence varying from season to season, upon their environment. Some of the environmental factors affected are moisture content and temperature of the surface soil, duration and intensity of sunlight, temperature of the air within the stand, wind velocity, and soil structure. The extent to which most of the above factors are modified by stands of varying densities is presented. One of the most apparent results is that the initiation and establishment of reproduction having an even rate of growth cannot be explained simply in terms of the amount of light allowed to reach the forest floor. The following facts have been established under the conditions of the present study at Frankston, Victoria: More moisture exists in the upper soil layers than in the lower, both in the open and under conditions of full canopy. During dry periods in summer there is more soil moisture in open areas than under the various degrees of tree canopies. Combined moisture losses due to the effect of transpiration and evaporation under forest canopy and interception of rain by the canopy apparently exceed the greater evaporation losses that occur in the open. Prevention of excessive water losses by trenching under fully stocked stands enabled seedlings to germinate and survive successive summers far better than on untrenched areas, where generally no survival may be expected. Optimum development of seedlings, as judged by dry weight, requires full or nearly full solar radiation; dry weight increases with increase in light intensity on both untrenched and trenched plots. Soil moisture is insufficient to ensure summer survival of regeneration (without trenching) in stands having a density > 250 trees/acre. Germination was found to decrease with increasing shade. Satisfactory summer survival can only be relied upon under stands having a density > 125 trees/acre. This fact requires consideration in the preparation of schedules for thinning and regeneration felling. Very high surface soil temperatures, occasionally 165° F., may be expected during the summer on open areas but spring-germinated seedlings suffer no direct damage. Under forest canopy, soil temperatures as low as 32° F. are not normally experienced. Even in the open, low temperatures are not likely to be a cause of severe damage to seedlings. Many seeds falling on needle litter do not germinate during the first year (unless the site is trenched). This is probably of significance in ensuring good regeneration through at least one year of poor seed production. The amount of light under the canopy of a fully stocked stand is not sufficiently reduced to inhibit the very early growth and development of regeneration, although lack of soil moisture during the critical periods invariably prevents seedlings surviving the hot dry summer. *From author's summary.*

2698. LIZARDO, L. **Natural regeneration of Pine forest in the Philippines.** *Filipino For.* 7, 1955 (40–51).

Pinus insularis grows well at 3000–7000 ft. altitude and covers some 94,000 ha. It can regenerate itself naturally after felling, provided that 10–15 well distributed seed-trees are left per acre, and that the regeneration area ia protected from fire, grazing, illicit felling etc.

2699. PURCELEAN, S. Regenerarea naturală la pinul neted (*Pinus strobus* L.). **[Natural regeneration of *P. strobus*.]** *Rev. Pădurilor* 71 (4), 1956 (210). 1 ref. [Rum.]

Describes the occurrence of natural regeneration under a pure group of 60-year-old *P. strobus* in Rumania.

2700. GOTHE, H. Pflanzenzahlen und Oberhöhen in einigen charakteristischen Kiefern-Naturverjüngungen im Gräflichen Forstamt Schlitz. **[Numbers of plants and heights of dominants in some characteristic Pine natural-regeneration areas in the Schlitz forest district.]** *Allg. Forst- u. Jagdztg.* 127 (11/12), 1956 (228–32). 24 refs. [G.g.e.]

Annual plant counts and height measurements of naturally regenerated Pine, as also of Larch and

Beech either naturally or artificially admixed, were taken on the N. margins of 4 clear-felled strips 25 or 30 m. wide, and on 3 sites under shelter of varying composition and density, all on Triassic bunter sandstone in N. Hesse. In all cases the soil had been strip-hoed before seedfall. Numbers of Pine tended to increase for some time, in two places up to the 6th year, possibly owing to the return of favourable ground cover. Figures varied widely, e.g. from 20,725/ha., mostly Pine, on the poorest strip, to 147,000 (one-third being Larch) on the best sheltered side, in the 3rd year. Heights also varied considerably, both poor and good height growth occurring with high plant number. Height differentiation between individuals started early in Larch, and late (5th or 6th year) in Pine. The climatic and site factors involved are discussed. The possibility of regenerating Pine naturally on these sites is considered to be proved.

2701. TEIKMANIS, A. Om den naturliga föryngringen efter markberedningar i Norrland. **[Natural regeneration after site cultivation in Norrland.]** *Norrlands SkogsvFörb. Tidskr.* 1956 (3), (385–442). 9 refs. [Sw.sw.g.]

The 27 plots in 10 different areas of N. Sweden are described, with details of locality, altitude, stand history, mixture of species, number of seed trees, ground vegetation, site preparation, extent of regeneration, etc. The main factors influencing regeneration were: stand type, altitude, aspect, soil moisture, soil type, site quality, ground vegetation, area, type and depth of cultivation, season of cultivation, presence of seed-trees, and seed-years. The following conclusions are drawn: (1) Regeneration after cultivation is good in pure Pine and Pine/Spruce, the number of plants often being larger in the former and growth better in the latter, and is usually good in Pine/Birch. (2) Cultivation is unnecessary in fairly dense uneven-aged residual Pine stands, where regeneration is usually adequate without it. (3) The decrease in regeneration with increasing altitude [cf. *F.A.* 12 No. 2861] is less marked on cultivated sites. (4) Regeneration of Pine on sandy soils is more successful on stony sites. (5) The presence of Birch in conifer stands favours regeneration after cultivation. (6) Cultivated sites in water-logged areas rarely carry regeneration; the use of upturned turf or heaped soil might encourage it. (7) On sites where e.g. *Deschampsia flexuosa*, *Calluna vulgaris* or *Polytrichum* are present in quantity, the cultivated areas are often quickly covered by a mat of vegetation, preventing regeneration. (8) Cultivation in long strips appears to favour regeneration, which occurs more readily at the edge of the areas cultivated. (9) Autumn is the best time for cultivation. (10) Too many seed trees are often left, and they are often removed too late.

232. Artificial Regeneration

See also No. 2858.

232.1. Choice and Trial of Species, Races etc.

See also Nos. 2408, 2421, 2423, 2425, 2429, 2686, 2811.

232.11. Species Trials, including Forest Gardens, Trials of Exotics etc.

See also Nos. 2489, 2824–5, 3302, 3619.

2702. SOMERVILLE, H. C., and STEWART, G. G. **A note on a high elevation wood in Midlothian.** *Scot. For.* 11 (1), 1957 (23–5).

Describes a plantation made about 1870 at 1600–1675 ft. alt., with a mixture of *Picea abies* and *P. glauca* and a few *P. sitchensis*, and felled in 1956. *P. glauca* had stood exposure better than *P. abies*, though the latter had produced larger timber trees. The Sitka had done very much better than either of the other two Spruces.

2703. HIORTH, G. Allverdens trær i norsk jord. **[Trees of the world in Norway.]** [The Author, Flekkefjord, Norway.] 1956. pp. 245. [Nor.] Price *Kr.*25.

Contains sections on: breeding; propagation from grafts, cuttings and seed; and planting out. The main part of the work lists 500 conifers and 1500 deciduous trees and shrubs (ornamental and forest species), with notes based on 36 years' experience, including information on cultivation, hardiness, suitability in Norway etc.

2704. ROHMEDER, E., and LEDERHUBER, M. Anbauversuche mit fremdländischen Baumarten im forstlichen Versuchsgarten Grafrath. **[Trials of exotics at the Grafrath experimental forest garden.]** *Deutsche Baumschule, Aachen* 6 (9), 1954 (233–49). 17 refs. [G.] E.M.B.

Describes the site conditions, climate and history of this forest garden of 34 ha. dating back to the 1880's, and discusses growth, yield, disease and frost resistance etc. of some of the 86 coniferous and 69 hardwood species grown there, and of some hybrids.

2705. SPLETTSTOESSER, A. Holzartenwahl für die Sonnenlagen der deutschen Mittelgebirge. **[Choice of tree species for sunny sites on the central German mountains.]** *Forstarchiv* 27 (8), 1956 (173–80). 16 refs. [G.g.]

Native species growing in the central mountain range show much poorer growth on the sunny, dry S., S.W. and W. slopes than on cooler N. or E. slopes. For the former the author proposes introduction of species from less temperate regions and in particular from Bosnia. Observations are made on the growth there of *Fagus orientalis*, *Pinus nigra*, *P. heldreichii*, *P. peuce* and *Picea omorika*, and their suitability for introduction is discussed with respect to site conditions. Recommendations are made on the different silvicultural treatments required for converting existing Beech and Fir to one or other of these exotics (e.g. to *P. heldreichii* on limestone) and for afforesting meadow and waste land. The introduction of American species, in particular *Pseudotsuga taxifolia*, *Pinus ponderosa*, *Abies grandis* and *A. concolor*, is briefly considered.

2706. QUERENGÄSSER, F. A. *Tsuga heterophylla* und *Thuja plicata*. **[*T. heterophylla* and *Th. plicata*.]** *Holz-Zbl.* 83 (30), 1957 (389–91). [G.]

Discusses the silvicultural and site requirements of the two species, the properties and uses of their timber, gives some information on the development

of stands in various parts of Germany, and makes recommendations for their joint establishment as under- and advance-plantings or on clear-felled sites.

2707. MITSCHERLICH, G. Die Roteichenversuchsflächen der Badischen forstlichen Versuchsanstalt. **[The *Quercus borealis* trial plots of the Baden Forest Research Institute.]** *Allg. Forst- u. Jagdztg.* 128 (1), 1957 (1–12). 10 refs. [G.g.e.]

Of 7 trial plots established in 1884–85 on excellent sites in the Rotenfels district in the Schwarzwald foothills, 3 were pure stands, spaced 1 × 2 m., and 4 were mixed, with Oaks at 3 × 3 m., and various conifers, including Douglas and Silver Fir, Spruce and Weymouth Pine, spaced 1 × 1 m. After 30 years, the Oak had outgrown all except Weymouth Pine in height. Most of the conifers have now disappeared. Mean diameters were greater on the originally mixed plots, but for Oak alone volume was greater on the pure ones, and the value about equal. Height growth continued longer and c.a.i. decreased less than shown in Bauer's and Zimmerle's tables [cf. *F.A.* 14 Nos. 2541, 3615] suggesting that a longer rotation, of 100–120 years, would be profitable. A comparison with Sessile Oak showed Red Oak at 69 years to be > 4 m. taller and ca. 60% greater in volume, but if the Sessile Oak reaches veneer quality, its value may still be superior.

2708. COSTIN, E. Ienupăul de Virginia (*Juniperus virginiana* L.) specie indicată pentru împădurirea terenurilor degradate. **[*J. virginiana* a suitable species for the afforestation of degraded soils.]** *Rev. Pădurilor* 71 (4), 1956 (214–21). 10 refs. [Rum.russ.g.]

On the basis of experimental data from Rumania and elsewhere, recommends the use of this species as a soil improver to prepare degraded soils for later planting with more valuable conifers.

2709. DIMITROV, P. M. Iz opita po săzdavaneto na kulturi ot bărzorastjašti dărvesni vidove pri zalesjavanijata na Botevgradskoto gorsko stopanstvo. **[Experience in planting fast-growing tree species when afforesting the Botevgrad forest estate.]** *Gorsko Stopanstvo* 10 (2), 1954 (55–9). [Bulg.]

Presents preliminary results of plantings (since 1948) of Poplars, Birches, *Acer negundo*, *Tilia grandifolia* and *Fraxinus americana* either along rivers or in mixed plantations.

2710. MINCKLER, L. S. **Observations on open-grown, non-native conifers in southern Illinois.** *Amer. Midl. Nat.* 54 (2), 1955 (460–5). 9 refs. B.A.P.

Measurements of height and diameter, and growth-ring counts on 62 trees of 9 different species, showed that Shortleaf and White Pine, when planted on uneroded sites, reached final heights of 50–60 ft. and diameters of 18–25 in. in 70–80 years. Scots and Austrian Pine showed much poorer growth. Shortleaf and White Pine will probably not grow to the heights attained in their native habitats. Diameter growth may cease abruptly at ca. 20–35 years, and the trees may be subject to abnormal damage from insects, disease and weather.

2711. GRAVELLONI, R. J., and CASSANI, P. E. Comportamiento de *Pinus taeda* L. y de *Pinus caribaea* Morelet en el delta de Paraná. **[Behaviour of *P. taeda* and *P. caribaea* in the Paraná delta.]** *Revista de la Facultad de Agronomía, Universidad Nacional de la Ciudad Eva Perón* 29 (1), 1953 (45–65). 19 refs. [Span.span.e.] C.G.B.

From observations on 12 × 100m. plots in experimental plantations of Celulosa Argentina S.A., data are presented on the growth and development of trees 5–10 years old. Both species tolerate wet soils up to 10 years, the age of the plantations studied. *P. taeda* has higher diameter and height increment values than *P. caribaea*. Yield per ha. at 10 years is 291 and 199 cu.m. respectively. An initial spacing of 2500 to 3000 trees/ha. is recommended.

2712. COLLIN, A. Note sur la croissance du limba introduit dans le sud de la Province du Kasai. **[The growth of *Terminalia superba* introduced into Southern Kasai [Belgian Congo].]** *Bull. agric. Congo belge* 47 (6), 1956 (1519–36). 11 refs. [F.flem.]

A study of the young growth of enrichment plantings in secondary and exploited forest, including correlations of height and diameter, showed this to be comparable with the growth at Mayumbe, the seed source. The 8-month-old potted plants used showed m.a.i. in girth and height of 8·39 cm. and 2 m. respectively at 5 years 4 months from seed.

2713. **[Site requirements of *Melia dubia*.]** *Rep. Dep. Agric. Seychelles 1955*, 1956 (14).

M. dubia, when given optimum conditions, is the fastest growing species at present planted in Seychelles, and has usually given first-year growth of > 22 ft., when planted on a good site. It appears, however, to be more discriminating than has been supposed hitherto; specimens planted on any but good sites are markedly slower in growth and less vigorous, and one plantation on a wet site was severely injured by shot borers. [Cf. *F.A.* 15 No. 207.]

2714. **[The Broadleaf Mahogany (*Swietenia macrophylla* King) in Puerto Rico.]** *Carib. For.* 17 (1/2), 1956 (4–5).

In the Hurricane Annie of 1955, planted Mahogany proved far more susceptible of windthrow than any associated native species. The first natural regeneration (2000–14,000/acre) was discovered in a 27-year plantation thinned 2 years before to 105 sq. ft./acre, leaving dominants of 11 in. mean. diam. On this site (800 ft. alt. with 90 in. rainfall) natural regeneration should be easy. At 1200 ft. with 140 in. rainfall, dominants and co-dominants in a 24-year plantations range from 12 to 21 in. d.b.h.

2715. ARDIKOESOEMA, R. I., and DILMY, A. Tentang djenis² kaju jang disebut 'mahoni' atau 'mahagoni', teristimewa keluarga *Khaya*. **[Some notes on Mahogany, especially *Khaya*.]** *Rimba Indonesia* 5 (5/6), 1956 (266–328). 31 refs. [Jav.e.]

Swietenia spp. in Indonesia produce timber of reasonable quality but lacking the decorative figure of that grown elsewhere. *S. macrophylla* and *S. mahagoni* are attacked by *Hypsipyla robusta*, and cultivation of *S. mahagoni* has been abandoned

because of *Loranthus* infestation. *Khaya* spp. have reached diameters of over 100 cm. in the Botanical Gardens, Bogor, after 90 years, and regenerate freely from seed. In nurseries, seeds in unshaded soil do not germinate, but in the shade there is 80% germination. Seed remains viable for 2 months. Direct sowing is not successful. Seedlings can be transplanted successfully in bamboo containers. Propagation by cuttings gave 80–100% success. On badly aerated soil, seedlings of *K. anthotheca*, *K. grandifoliola* and *K. senegalensis* died after 123, 167 and 190 days respectively. The first two species are little affected by shoot borers, but *K. senegalensis* is heavily attacked. *K. grandifoliola* and *K. anthotheca* grew equally well in wet and dry climates, but *K. senegalensis* does better in a drier climate. Interplanting with *Eucalyptus* prevents growth of *lalang*. Of other species tried, *Lovoa klaineana* is so far unsuccessful; *Chikrassia tabularis*, *Canarium schweinfurthii*, and *Carapa guianensis* grow well but are damaged in varying degrees by *Hypsipyla robusta*; *Aucoumea klaineana* grows well but dies after grass fires; *Cedrela mexicana* grows well but is severely attacked by borers; and *Ricinodendron africanum*, and Australian *Eucalyptus* spp. do well in dry regions. Trials of *Dysoxylum* spp., *Shorea* spp., *Calophyllum calaba*, *Swietenia candollei* and *S. cirrhata* are still at an early stage. *From authors' summary.*

2716. LIZARDO, L. **Methods used in the trial plantings of Eucalypts in the Philippines.** *Filipino For.* 8, 1956 (91–101).

Describes nursery practice, planting methods etc. The most successful species are *Eucalyptus deglupta*, *E. robusta*, *E. tereticornis*, *E. globulus*, *E. saligna*, *E. rostrata*, *E. viminalis* and *E. pulverulenta*, the older trees of which are now bearing seed, which is used for further trials.

2717. THIRAWAT, S. **The value of Eucalypts in Asia.** *Indian For.* 82 (12), 1956 (660–7). 5 refs.

Briefly reviews the trials so far made, and makes suggestions for trials of suitable species in tropical and subtropical Asia.

2718. BROCKWAY, G. E., and KHAN, M. I.-UR-R. ***Eucalyptus* introduction and cultivation in West Pakistan.** *Pakistan J. For.* 6 (4), 1956 (245–58). 3 refs.

A report submitted to the FAO World Eucalyptus Conference held in Rome, Oct. 1956.

2719. CLAUDEL, Y. Les plantations forestières dans le Rharb. **[The forest plantations in the Rharb.]** *Rev. for. franç.* 9 (2), 1957 (81–105). [F.]

Gives a history of these plantations (mainly Eucalypts) on the sandy soils of the Rharb in French Morocco, which were begun in 1922, with an account of methods of soil preparation, planting etc., costs, yields, and financial returns. [Cf. *F.A.* 17 Nos. 3579–80.]

232.12. Races and Provenance Trials

See also section 165 and Nos. 2531, 2616.

2720. GATHY, P. Recherches belges sur la variabilité génétique des espèces forestières. **[Research in Belgium on the genetic variability of forest species.]** *Silvae Genet.* 6 (1/2), 1957 (32–8). Many refs. [F.f.g.e.]

Reviews research carried out since 1900 on provenances of *Pinus sylvestris*, *P. nigra*, *P. nigra* var. *calabrica*, *Picea abies*, *Pseudotsuga taxifolia* f. *viridis*, *Larix decidua* and *L. leptolepis*, and recommends provenances suitable for introduction into Belgium or for further testing.

2721. SCHNEIDER, B. Aufnahmeergebnisse verschiedener Kiefernrassen in einem nordwestdeutschen Kiefernrevier. **[Growth results of various Pine provenances in N.W. Germany.]** *Forst- u. Holzw.* 12 (4), 1957 (49–53). 6 refs. [G.g.]

Discusses the height and b.a. development, crown- and stem-form of provenances from E. Prussia, Silesia, Brandenburg, Saxony, N. Germany ('Darmstadt') and Belgium, planted or sown on fine sands of medium fertility near Burgsteinfurt (North Rhine—Westphalia) aged ca. 20–50 years. The Belgian provenances showed well formed stems and sound roots, whereas the 'Darmstadt' Pine, which is widespread in the region, had bad stem form, and poor root systems susceptible to *Fomes annosus.*

2722. BALDWIN, H. I. **Scotch Pine surpasses Red Pine in early height growth.** *Fox For. Note* No. 63, 1956. pp. 1.

Pinus sylvestris from 16 different sources was planted in 1940 in randomized plots separated by 2 rows of *P. resinosa*, at a state nursery in New Hampshire. After 6 growing seasons the Scots Pine was nearly twice as tall as the Red Pine, Baltic provenances being the best.

2723. WRIGHT, J. W., and BALDWIN, H. I. **The 1938 International Union Scotch Pine provenances test in New Hampshire.** *Silvae Genet.* 6 (1/2), 1957 (2–14). 25 refs. [E.e.f.g.]

A report on one of a series of Scots Pine provenance tests undertaken by I.U.F.R.O. in plantations established in 1942 on old fields in the Fox and Vincent State Forests, near Hillsboro. Trees were spaced at 4·2 × 4·2 ft. In 1941 measurements were taken of height and needle length and in 1955 of height, diam. and branch diameter. In 1955 also, observations were made on form, porcupine damage and fruit production. Statistically significant correlations were found between 3- or 4-year height and 17-year height. The statistical analyses indicate that most of the geographic variation in Scots Pine is discontinuous, not clinal. The provenances can be grouped into 7 geographical ecotypes: (1) northern Scandinavia, (2) north-central Scandinavia, (3) central Scandinavia, (4) southern Scandinavia, (5) Latvia-Esthonia, (6) Germany-Poland-Czechoslovakia-Hungary and (7) Belgium (from planted trees, possibly of French provenance). There were statistically significant differences between provenances assigned to different geographical ecotypes, but none between provenances assigned to the same geographical ecotypes; (5) was moderately fast growing (18·5 ft. in 17 years from seed) and had satisfactory bole form; (7) was the fastest growing but had the most basal sweep, lean, large crooks and porcupine damage; (6) was next in growth rate

and also in amount of form defects and porcupine damage; the Scandinavian ecotypes were slow growing but had few bole defects; (1) and (7) fruited most heavily. Certain of the geographic ecotypes can be identified with previously described taxonomic varieties. The slow- and fast-growing provenances grew at the same rate in large rectangular plots as in row plots. *From authors' summary.*

2724. BALDWIN, H. I., and MURPHY, D. **Rocky Mountain Douglas Fir best for New Hampshire.** *Fox For. Note* No. 67, 1956. pp. 2.

Douglas Fir from a high altitude in New Mexico showed best growth and survival after 5 years on the planting site (9 years from seed), followed by lots from Idaho, Montana, and Washington. All Douglas Fir did better than Balsam Fir on this dry site, and it is considered that Douglas of the right origin might usefully be planted for Christmas trees in S. New Hampshire.

2725. BAGNARESI, U. Osservazioni morfo-biologiche sulle provenienze di castagno giapponese coltivate in Italia. [**Morphological and biological notes on the provenances of *Castanea crenata* cultivated in Italy.**] *Pubbl. Cent. Stud. Castagno, Firenze* No. 3, 1956 (7–48). 26 refs. [It.f.e.g.]

Results of studies made by the author on a large number of provenances derived from seed imported direct from Japan in 1920–30 and raised in 5 experimental stations.

2726. KRAHL-URBAN, J. Über Eichen-Provenienzversuche—Erster Bericht über Anlage und vorläufige Ergebnisse meiner Versuchsflächen. [**Oak provenance trials—First report on the establishment of trial plots and some preliminary results.**] *Silvae Genet.* 6 (1/2), 1957 (15–31). 18 refs. [G.g.e.f.]

In 1950, seed of various German provenances of *Quercus robur* and *Q. sessiliflora* were sown in test plots in Bramwald. In spring 1952 further trial plots were established there with provenances from France, England, Sweden and Denmark. Parallel trial plots were also established in 1951 at Syke near Bremen, at Grafrath near Munich and also at Bogesund near Stockholm. Some preliminary data are presented on seed weight, height increment, time of flushing, lammas-shoot formation, autumn colouring, leaf-fall, susceptibility to mildew, and some form characteristics. The results already show a large difference between many provenances growing under the same conditions, as also some modifying effects of different growth conditions. *From author's summary.*

232.13. Trials of Hybrids and Other Products of Tree Breeding

See also section 165.

2727. **Statistical methods in experiments. Measurements and observations in Poplar experiments. Germany.** [*Docum.*] *12th Sess. stand. exec. Comm. int. Poplar Comm., Brussels 1956* No. *FAO/CIP/CP/7-L-a, b & c*, 1956. Each pp. 2. [E.]

Three answers to questionnaire *FAO/CIP/77.* [See *F.A.* 18 No. 332.]

232.2. Preparatory Work. Auxiliary Measures

See also Nos. 2413, 2800, 2808, 2901.

2728. MATHUR, R. B. **The role of tractors in artificial regeneration in *tarai* areas of Uttar Pradesh.** *Indian For.* 83 (2), 1957 (101–5).

It has hitherto been difficult to obtain the necessary labour to establish plantations in these areas, which are very malarious, with a profuse growth of grass that smothers forest species, and innumerable leeches. The use of tractors, to remove stumps, cultivate the ground, and control grasses, has now made plantation work practicable, and some of the methods employed are described with some indication of costs.

2729. RUTH, R. H. **Plantation survival and growth in two brush-threat areas in coastal Oregon.** *Res. Pap. Pacif. Nthwest. For. Range Exp. Sta.* No. 17, 1956. pp. 14. 3 refs.

In spring 1949, conifer plantations were made on a 44-acre site of Douglas Fir and an 81-acre site of Sitka Spruce/Western Hemlock that had been clear felled 1–2 years earlier. Examinations over a 5-year period showed that competition with Red Alder, salmonberry [*Rubus spectabilis*] and associated shrubs was intense; only 37% of the planted Douglas and ca. 25% of the planted Spruce and Hemlock survived. Recommendations are to plant immediately after felling, with carefully selected stock, plus broadcast burning or chemical brush control.

2730. HOLT, L., SWAN, H. S. D., and WEETMAN, G. F. **Forest soil scarification.** *Woodl. Res. Index Pulp Pap. Res. Inst. Can.* No. 98 (*F*-2), 1956. pp. 50. 20 refs.

Data are given of the time and cost of scarifying by (1) Imset Scarifier, (2) hand hoeing, (3) bulldozer blade, (4) Fleco Root Rake, (5) Athens disc plow and, (6) Howard Rotavator, and of its effect on the survival of spring and autumn, line and broadcast sown, Black and some White Spruce, in burned and unburned cutovers, and in open Black Spruce/Jack Pine forest. Method (1) was fastest and cheapest and gave the best survival, and others following in the order given, for Black Spruce, with the unscarified control worst. Ultimate survival was unlikely to be adequate in the open areas for lack of shade and in the open stand (where only Black Spruce was sown), because of weed competition and litter smother.

2731. ROSENSTOCK, H. A. Motorfräsen mit eignem Antrieb im Forstbetrieb. [**Self-powered rotary cultivators in forestry work.**] *Forstarchiv* 28 (2), 1957 (46–8). [G.]

Technical data and prices are given for various German makes of cultivator, using either diesel oil or petrol; running costs are tabulated. For ground cultivation in a stand or in the open, where there is thick ground vegetation, the Pionier cultivators are recommended. The Hako cultivators are useful for lighter work.

2732. SORIANO LLORET, A. Los aperos y los motores de sangre, en los trabajos de repoblación

forestal. **[Equipment and draught animals in afforestation work.]** *Montes, Madrid* 12 (71; 72), 1056 (339–49; 413–24). [Span.]

Discusses the usefulness of animals, particularly oxen, for contour ploughing in difficult terrain, and reviews suitable tools and methods, also equipment and care of the animals.

2733. HUYGH, A. Travail du sol à l'établissement de bois en Campine. **[Soil cultivation preparatory to planting in the Campine.]** *Bull. Soc. for. Belg.* 64 (3), 1957 (137–60). 13 refs. [F.]

A general discussion of the basic principles involved in soil cultivation, leading to the conclusion that in these soils shallow cultivation with a disc plough or harrow or some such implement is the best treatment, deep ploughing being resorted to only to destroy heavy infestations of weeds or hard pan.

2734. SIEBENBAUM, H. Vollumbruchverfahren. **[Complete ploughing treatments.]** *Forstarchiv* 28 (1–2), 1957 (8–16; 34–41). 63 refs. [G.g.]

A comprehensive survey, from the financial and silvicultural aspects, of methods of cultivating waste land before afforestation. Tables show the time consumption and costs for all phases of the operation: preparatory work, ploughing, and weeding after sowing or planting. The basis for calculating costs from man-hours or machine working time is shown. In the table, the lowest, highest and mean figures are given to represent the possible range in time and money values. Ploughing methods are classified as shallow, medium-deep and deep, and the performances of various makes of German tractors are reviewed for each method. For medium-deep ploughing the caterpillar Stubbenknecht I is recommended, for deep ploughing the Stubbenknecht II. Costs of ploughing rise with the depth of cultivation; medium-deep ploughing is recommended except where soil conditions demand deep ploughing. The cost of preparatory work in clearing vegetation depends on the thoroughness of the work, but considerably less weeding and tending is required later if the ground is well prepared.

2735. SCHWANEBECK, G. Vollumbruch—eine Möglichkeit zur Technisierung der Walderneuerung? **[Complete cultivation—a way to mechanize artificial regeneration?]** *Forst u. Jagd.* 5 (3), 1955 (97–100). 7 refs. [G.]

Describes techniques for various types of site and ground cover, and discusses the advantages of the method for Pine plantations, particularly on *Calamagrostis*-infested sites. High costs are often offset by lower tending costs. The 'Mammut' hydraulic stump-grubber is briefly described.

2736. **Site preparation prior to planting.** *Rep. For. Timb. Bur. Aust. 1955*, 1956 (25).

An experiment established in 1941 to compare the effectiveness of various methods of soil preparation before planting *Pinus radiata* seedlings was examined. Three treatments were tested: (1) mattock holes in otherwise unprepared ground, (2) ploughing 2 furrows along each planting line, (3) ploughing 3 furrows along each planting line. It is concluded that, in the conditions of the experiment, (2) and (3) resulted in greatly increased survival and growth; (2) appeared to be as effective as (3).

232.3. Seed, Nursery Practice, Direct Sowing

232.31. Seed

232.311. Seed Production (Seed Years, Seed Crops; Seed Orchards and Methods of Inducing Seed Production)

See also Nos. 2489, 2501, 2773–4, 2880, 3062–3, 3145.

2737. COOPER, R. W., and PERRY, J. H. **Slash Pine seedling [seeding] habits.** *Sth. Lumberm.* 193 (2417—Christmas No.), 1956 (198–9).

Describes seed-fall studies in (1) a well stocked, and (2) a partially stocked stand, and (3) an isolated Pine pond in Florida. In (1) > 100,000 seeds/acre fell in the best year, against < 10,000 in 4 of the 6 years observed. Seed quality was best in the best seed-year. In (3) ca. 50% of the seed fell within 50 ft., and 90% within 150 ft., of the seed source. Trees released for 3 growing seasons produced increased quantities of seed, and partial release several years before the final cut is recommended.

2738. GYSEL, L. W. **Measurement of acorn crops.** *For. Sci.* 2 (4), 1956 (305–13). 18 refs.

Acorn production varies on similar sites with species, age within the stand, and individuals. Climate influences it, but apparently not cyclically. More acorns are produced in the sunny parts of the crown. Sampling methods (tree and ground counts, quadrats and traps) are compared and analysed, and their accuracy and correction discussed. To obtain a reliable estimate of acorn production from individuals in a stand of a given species, similar in size and crown class, samples from at least 15 trees are required.

2739. CHRISTENSEN, D. M., and KORSCHGEN, L. J. **Acorn yields and wildlife usage in Missouri.** *Trans. N. Amer. Wildlife Conf.* 20, 1955 (337–57). 66 refs. B.A.P.

Acorn yields were studied on 163 Oaks (*Quercus velutina, Q. marilandica, Q. coccinea, Q. alba, Q. stellata*) and data are presented on annual yields over the period 1947–52. Simple correlation coefficients were computed between the number of mature acorns produced and d.b.h., crown length, crown diameter, crown surface area and radial increment. Crown diameter had the highest correlation with acorn yield. Data are also presented on the % of mature acorns suffering damage from insects, on the importance and availability of acorns as food for wildlife and on the effects upon various animal species of feeding on acorns.

2740. MARQUARDT, H. Theoretische Grundlagen der Samenplantage I. Die Selektion der Auslesebäume. II. Prüfverfahren zur Aufklärung der genetischen Situation von Auslesebäumen. III. Die Typen der Samenplantagen und ihre züchterischen Möglichkeiten. **[The theoretical bases of seed orchards. I. The selection of elite trees. II. Clarifying**

the genetics of elite trees by tests. III. Types of seed orchard and their relative efficiency for tree breeding.] *Forstarchiv* 27 (1; 2; 4), 1956 (1–7; 27–30; 77–84). 53 refs. [G.]

(I) Discusses the genetical principles to be considered in selection, and points out that when an individual tree is selected from a stand, its genetic constitution, the penetrance or expressivity of the gene complex governing the desirable property, and its site tolerance remain unknown factors. (II) In carrying out trials of grafted clones, a method of reducing the influences of the rooted stock is to use genetically similar scions from an elite tree. When these have developed sufficiently, scions from the elite tree to be tested are grafted on them. The graft clones are reared under identical conditions, and the variance of characters is observed to determine whether the genetical or environmental components predominate in each. The site tolerance of the clones can be tested by growing them on average, wet, or dry sites and noting whether the desired characters still prevail. To test the effect of free pollination in a seed orchard, a tree show should be made from progeny of seed derived from a mixture of pollens and from selected combinations. (III) The author distinguishes between 3 types of seed orchard: (1) Where the clones are taken from a stand that is particularly valuable or suited to the locality, in order to obtain sufficient and regular supplies of seed. This type aims at maintaining, not, improving tree quality. (2) The 'typical' seed orchard where the clones are taken from plus trees (phenotypes) on the basis of morphological characters alone. As the genetic constitution of the trees is not known, this type is no improvement on (1). (3) Where, after test, clones are raised for a few selected properties e.g. tolerance to certain climatic conditions; this type of orchard does not aim at producing a broad range of desirable morphological characters.

2741. GRÜLL, H., TRAUNINGER, W., and WETTSTEIN, W. Neuzeitliche Forstsaatguterzeugung in Pfropfplantagen. 1. Teil. Plusbaumauswahl und Propfung. **[Modern forest seed production in seed orchards. Part I. Selection of plus trees and grafting.]** *SchrReihe forstl. VersAnst. Mariabrunn* No. 4, 1956. pp. 74. [G.g.]

An account of practical experiences, describing in particular, with illustrations, the selection and treatment of stocks and scions, grafting methods, time of grafting, planting out, tending etc. Most of the work was done in the greenhouse on potted stock, generally 2–3 years old. Both conifers and hardwoods are discussed. Results are encouraging.

2742. HOEKSTRA, P. E. **Pre-harvest loss of cones in Slash Pine.** *Sth. Lumberm.* 193 (2417—Christmas No.), 1956 (215–6).

In a test count of 280 cones from 13 of the best cone-bearers in a N. Florida seed-production area, 155 were sound, 65 partially damaged, and 61 worthless. A cone-stimulation study on 6-year Slash Pine gave only 250 mature cones from 755 flowers, but 83·7% of them were sound. In 440 artificial pollinations on 51 trees of varying ages, the % of mature cones obtained varied from 30·5 to 45·1 over 3 years; more research into the causes of failure is advocated.

232.312. Seed Collection, Extraction and Grading (including Seed Weight)

See also Nos. 2754–5.

2743. NETOLICKÝ, J. Záchranný pás pro trhače lesních semen a jeho použití. **[Safety belt for forest seed collectors and its use.]** *Lesn. Práce* 35 (3), 1956 (128–31). [Cz.]

Illustrated description of the safety belt (Czechoslovak Standard No. CSN 359715) and its use in practice.

2744. MIČEV, B. Kak da dobivame smradlikovi semena. **[Harvesting the seeds of *Rhus* and *Pistacia* spp.]** *Gorsko Stopanstvo* 10 (2), 1954 (60–4). [Bulg.]

Describes the seeds of *Rhus cotinus*, *R. coriaria*, *Pistacia terebinthus* and *P. lentiscus*, and methods of harvesting them in Bulgaria.

2745. KANDASWAMY, M., and VENKATA ROW, A. **A note on the extraction of seeds from the pods of *Prosopis juliflora*.** *Madras Agricultural Journal, Coimbatore* 43 (10), 1956 (520–1). 2 refs. L.S.

Describes experiments to facilitate seed extraction (*a*) by controlled fungal action, which, if pods were not yet quite dry, worked well but was injurious to the seed, and (*b*) by soaking the pods in water, extracting the pericarp and seeds by slight pounding, then treating with dilute H_2SO_4 (thus facilitating final extraction without injury to germinative capacity).

232.315. Seed Storage and Treatment

See also Nos. 2783, 2791.

2746. BARTELS, H. Über den Wassergehalt der Nadelholzsamen. **[The moisture content of conifer seeds.]** *Forstwiss. Cbl.* 75 (3/4), 1956 (124–8). 7 refs. [G.g.]

The moisture content of seeds of Spruce, Pine and Larch in equilibrium with the atmosphere was tested at 10° C., and at relative humidities of 3–97%. Adsorption tests at 4, 25 and 40° were also carried out. The results show that relative humidity in rooms where seed is exposed to the atmosphere should not exceed 40%. The seed-coat takes up more moisture than the kernel and therefore Larch, with its greater proportion of seed-coat, has the highest moisture content of the species tested. Seed-coats and kernels in the different species have specific adsorption capacities. Equilibrium moisture content is attained after ca. 48 hours' exposure of the seed. The seed-coat offers very little obstruction to the penetration of moisture into the kernel. *From author's summary.*

2747. MIČEV, B. Predposevna podgotovka na plodovete na obikovenija oreh. **[Preparation of the fruits of *Juglans regia* before sowing.]** *Gorsko Stopanstvo* 10 (3), 1954 (119–23). [Bulg.]

Although Walnut seed sown in autumn does not require any special pre-treatment, the seedlings are exposed to the danger of late frosts and of destruction by rodents; hence spring sowing is preferred.

For winter storage the fruits are first dried for 5–10 days in a 5–10 cm. layer that is turned 3–4 times daily, then stored at 0–5° C. in boxes or on shelves with alternate layers of fruit (3–5 cm.) and clean sand (2–3 cm.). Before sowing the nuts are stratified for 30 days in clean moist sand at 3–5° C.

2748. KOOTZ, F. W. Zur Stratifizierung von Kiefernsaatgut. [**Pre-treatment of Pine seed.**] *Forst u. Jagd* 5 (9), 1955 (389–95). 4 refs. [G.g.]

Reports on trials in several E. German nurseries with wet/cold storage for varying periods, either simply in running water, or in holes in the ground on ice or in water, or, preferably, in refrigerated cellars. Seed so treated came up quicker and more densely, except where it had pre-germinated owing to insufficiently low temperatures.

2749. ANTONOV, D. A. Ured za predposevno tretirane na njakoi gorski semena. [**Apparatus for treating some forest seeds before sowing.**] *Gorsko Stopanstvo* 10 (8), 1954 (381–3). [Bulg.]

Illustrated description of a device (a hollow sphere with a handle, consisting of two fitting halves and made from wire mesh) for dipping the seeds of Leguminosae (*Acacia*, *Robinia*, *Gleditsia*) for 0·6–1 sec. in boiling 35% NaOH solution, in order to break down the suberin of the testa.

2750. **Germination pre-treatment [for *Borassus caryota*].** *Rep. For. Adv. Gambia 1954*, 1956 (6).

An experiment was made on treatment of the seed of this Palm, which is said to be difficult to germinate. Cutting the seed-coat gave 100% germination within a month, and soaking in water for one week gave 57% compared with 11% for controls. Untreated seed continued to germinate and after 5 months 61% had germinated. Light boiling killed the seed.

2751. MORGENEYER, W. Untersuchungen über die Beseitigung der Keimhemmung beim Samen des Hirschkolbensumachs (*Rhus typhina*). [**The stimulation of germination in *R. typhina*.**] *Arch. Forstw.* 5 (3/4), 1956 (203–42). 6 refs. [G.g.]

The hard-coated seeds of this species, many of which are empty, germinate at the rate of 10% per year. Stimulation tests (including filing, sandpapering and polishing, soaking in various solutions and in hot water, and stratification) are described, and seed weight, size, shape and colour and fruit colour are given. Full seed can be separated by the shape and colour of the fruit but no certain mechanical or flotation method was developed. Filing gives 100% germination but is suitable only for small lots. Boiling (½ min.) is simple and cheap and gives good results (up to 79%) but requires the removal of the fruit hull or the oil content. Soaking in H_2SO_4 accelerates germination to ca. half the time taken by boiled seed, but correct soaking time is difficult to determine.

2752. BERGANN, F. Zur Behebung der sogenannten Hartschaligkeit des Robiniensaatgutes. [**The treatment of 'hard coat' in Robinia seeds.**] *Forst u. Jagd* 4 (5), 1954 (176). 2 refs. [G.]

Discusses the drawbacks of heat treatment and recommends a simple method of seed scarification by pounding them lightly in a bed of fine quartz sand either in a mortar or dish, or on a larger scale by trampling with heavy boots. Germination %s of 80 and over were obtained.

232.318. Seed Testing. Germination Tests. Seed Quality

See also No. 2788.

2753. STARČENKO, I. I. Sezonnye osobennosti energii prorastanija semjan derevjev i kustarnikov. [**Seasonal variation in the germinative energy of seeds of trees and shrubs.**] *Bot. Ž.* 41 (9), 1956 (1355–9). 6 refs. [Russ.]

Various series of tests were made between 1947 and 1952 on seed of *Pinus sylvestris*, *Picea abies*, *Betula verrucosa* and *Caragana arborescens* subjected to variable temperature (24 to 36° C.) in a Jacobsen germinator. Tabulated results show that for all species the germinative energy is much higher in spring and summer than in autumn and winter, irrespective of the age or grade of seed. A special comparison was also made of the germinative energy of *P. sylvestris* seed in (*a*) heated, and (*b*) unheated germinators. In Jan.–Feb. values for (*a*) were much higher than for (*b*); in March and Sept. the differences were not great, and germinative energies were sometimes higher for (*b*). The winter tests showed that seed from western sources gave a greater response to treatment (*a*) than seed of eastern origin.

2754. HUSS, E. Om barrskogsfröets kvalitet och andra på såddresultatet inverkande faktorer. [**On the quality of conifer seed and other factors affecting the plant %.**] *Medd. SkogsforsknInst., Stockh.* 46 (9), 1956. pp. 59. 21 refs. [Sw.sw.e.*e.*] Price *Kr.*3.

When two batches of high-grade seed and two poor ones [species not stated] were each divided into 4 maturity classes, ca. 90% of the good seeds, but only 30% and 37% of the poor, contained a fully developed embryo. The % of seedlings emerging was greatest for the highest maturity class, and within that class markedly greater for the good seeds. In all classes, some seedlings emerged during the next growing season.

In sowing trials on forest land in various parts of N. Sweden with Spruce and Pine seed more or less damaged by unsuitable but widely practised mechanical de-winging, decreases in plant % were disproportionately greater than differences in germinative capacity. Seedling losses and number of blank patches were also greater, and mean heights and weights of seedlings less, when damaged seed was used (despite less crowding in the seed patches), and the cost per 10 viable seedlings was considerably greater. These and other experiments with defective and sound seed, are summarized in a table, showing lower plant %s and higher seed quantities required for poor seed than the mean values computed by Tirén [see *F.A.* 14 No. 1166] and vice versa for good seed. Other factors reported, from 7 experimental sowing areas in Norrland, include survival % and plant heights in relation to sowing density and size of patch, showing a superiority for smaller patches and thinner sowing.

2755. BARTELS, H. Über die Abhängigkeit der Keimlingsgrösse vom Gewicht und vom Entwicklungszustand des Samens bei Fichte und Kiefer. **[The relation between size of seedling and the weight and maturity of seed in Spruce and Pine.]** *Allg. Forst- u. Jagdztg.* 127 (8/9), 1956 (164–8). 9 refs. [G.g.]

When seedlings from 9 Spruce and 3 Pine provenances were examined 21 days after germination, a weak correlation was found to exist between seedling size and seed weight. This was most marked for above-ground parts in Pine, and total length in Spruce. When seed was classified by embryo maturity (determined by X-rays), mean length of hypocotyls was somewhat smaller in plants from underdeveloped seeds, but no individual prediction of development from X-ray examination was possible, nor could differences between sound and heat-damaged seeds be detected. The provenance containing most immature seed had the lowest germination %.

232.32. Plant Rearing. Nursery Practice

See also Nos. 2703, 2715–6, 2862, 3619.

2756. ČVANČARA, R. Lesní školky v Řečanech n. Labem. **[Forest nurseries at Rečany n. Labem.]** *Sborn. čsl. Akad. zeměd. (Lesn.)* 29 (1), 1956 (63–76). 1 ref. [Cz.russ.g.]

History (since founding in 1895), production, and national importance of these nurseries, which extended in 1935 to 40 ha.

2757. SCHWENKE, H. J. Einige Erfahrungen über die Anzucht von *Abies nobilis* (*procera*). **[Raising *A. procera* in the nursery.]** *Forsch. u. Berat. (Forstw.) Landesaussch. landw. Forsch. Landes Nordrhein-Westfalen* No. 2, 1956 (116–27). [G.g.]

Stratified seed with a germinative capacity of 39% were sown, on (*a*) Larch litter, (*b*) shaded and (*c*) open nursery beds. Field germination ranged from 16 to 38%. Best results, including % of transplantable seedlings, were obtained in (*c*). Losses from damping off were 100% in (*a*), and 20–25% in (*b*) and (*c*). Orthozit 50 [captan] gave good control.

232.322. Preparation and Treatment of Soil, including Maintenance of Fertility

See also Nos. 2584–6.

2758. WARCUP, J. H. **Chemical and biological aspects of soil sterilization.** *Soils & Fertil.* 20 (1), 1957 (1–5). 51 refs.

A review of the literature under the heads: effects on physical and chemical properties, phytotoxicity, and effects on soil populations (bacteria, actinomycetes, fungi, and protozoa).

2759. KURAMOTO, M., and TSUDA, K. **[Manure examination for *Larix*. (V) The effects of ammonium sulphate and urea on the growth of seedlings. (VI) The availability of some manures.]** *Spec. Rep. For. Exp. Sta. Hokkaido* No. 4, 1955 (11–22). 4 refs. [Jap.jap.e.*e.*]

(V) In 4-month small-scale greenhouse tests with two nursery soils, plots treated with urea showed the greater green weight and their seedlings produced early winter buds. (VI) In a similar test with 7 different N and P manures, high yields of green weight were got from fish manure and bone dust in one soil and, from Ca superphosphate in the other. *From authors' summary.* [Cf. *F.A.* 16 No. 2906.]

2760. VLAMIS, J., BISWELL, H. H., and SCHULTZ, A. M. **Nutrient responses of Ponderosa Pine seedlings.** *J. For.* 55 (1), 1957 (25–8). 28 refs.

Pot tests were made at Berkeley, Calif., with Romaine lettuce, Atlas barley and Ponderosa Pine seedlings. The tests were in triplicate, using a forest soil of sandy loam and (*a*) applying a complete fertilizer, (*b*) omitting one nutrient at a time, plus a control. The nutrients were added at 200 lb. N, 300 lb. P_2O_5 and 200 lb. K_2O/acre. After one year, the Pine had made better growth on unfertilized soil than either lettuce or barley; all 3 species responded vigorously to a complete fertilizer treatment. When N was omitted, all 3 species were severely retarded. When P_2O_5 was omitted, there was little effect on Pine but lettuce and barley were severely retarded. Omission of K_2O had no noticeable effect. N fertilizers alone may be sufficient to increase growth of Ponderosa Pine seedlings.

232.323. Sowing and Covering

See also No. 2754.

2761. POLENO, Z. Kalkulace množství semene pro výsev do školek i do porostů. **[Calculation of seed quantities for sowing in nurseries and in stands.]** *Lesn. Práce* 35 (4), 1956 (152–60). 4 refs. [Cz.]

Quotes the weights/ha. of nursery [bed] area for seed of 13 species, and calculates the plant % for these and one other species from data contained in Czechoslovak standard ČSN 482111. On the basis of these values the author presents tables giving for the 13 species the weight and number of seeds to be used per are and metre-run of nursery seedbed. Another table gives numbers of seeds per 'nest' and hectare for nest sowing.

2762. PURCELEAN, S. Metodă de producere a puieților de anin negra (*Alnus glutinosa* Gaertn.) din sămînță. **[A method of raising *A. glutinosa* seedlings.]** *Rev. Pădurilor* 71 (5), 1956 (325–6). [Rum.]

In March the seed is soaked for 48 hours in snow water and then sown on the bare soil, either broadcast or in drills, at a rate of 15–20 g./sq. m., and immediately covered with 5 cm. of snow. When the snow melts, the seedbeds are covered with a thin (2–3 mm.) layer of sand. Watering is unnecessary if the nursery is on a site with a high water-table.

232.324. Transplanting and Lining Out

2763. **[Sorting and packing of nursery stock.]** *Rep. N.H. For. Comm. 1955/56*, 1956 (56–8).

A sorting and counting table with conveyor belt is being used to handle seedlings at the New Hampshire State Nursery. The table is a wooden frame structure 5 ft. wide by 20 ft. long, with an endless canvas belt 3 ft. wide running lengthwise of the table on rolls powered by an electric motor. The belt is marked off in small numbered sections; 5–6 women, standing on each side of the table, sort, count and drop 5 good seedlings on to each section of the belt,

which carries them to the end of the table, where a woman picks up 5 or 10 bunches of seedlings and places them on another table in bunches of 25 or 50 according to the age of stock, where two women tie them with jute twine.

232.325. Tending (in both Seedbeds and Transplant Beds)

See also No. 2976.

2764. MAHLSTEDE, J. P. [Editor]. **[Weed control in] ornamental nurseries, forest nurseries, shelterbelts and all others.** *Res. Rep. 12th ann. Nth. Cent. Weed Control Conf.* 1955 (156–9). O.R.E.

A mixture of CMU at ½ lb./acre plus SES at 4 lb./acre, applied in water at 86 gal./acre as a pre-emergence herbicide on established plants of *Taxus cuspidata* var. *intermedia*, gave good weed control. Two-year-old Norway Spruce, and Japanese Maple and three-year-old *Taxus cuspidata* var. *intermedia* were unharmed by 1 to 4 applications of CMU or SES, or both combined, at respective rates of ½, 4 and ½ + 4 lb./acre. Vapam 4-S, a soil-fumigant solution of Na *N*-methyl dithiocarbamate (anhydrous), applied at 2 to 4 pints/100 sq. ft. in 15 gal. water to weed-free soil in transplant beds, gave satisfactory weed control (*L. C. Chadwick*, *P. A. Barker* and *W. D. Chambers*). Midsummer applications of Natrin (2,4,5-trichlorophenoxyethyl sulphate), at 4 and 6 lb./acre, applied in water at 100 gal./acre, gave good control of broadleaved weeds without injury to one-year cuttings of *Taxus media* var. *wardi* (*J. W. Herron*). Applications of a mixture of CMU at ½ lb./acre plus SES at 4 lb./acre gave good control of weeds on plots containing a mixture of coniferous transplants. Slight stunting and burning of Red Cedar followed 3 treatments with a mixture of SES plus NP (*N*-1-naphthyl phthalamic acid) during 2 seasons. (*R. Taylorson* and *L. G. Holm.*)

232.327. Protection Measures in Nurseries

See Nos. 2994–5, 2997–9, 3113.

232.328. Vegetative Propagation

See also Nos. 2489–90, 2741, 2793, 2795.

2765. KÖRING; JOACHIM, H. F. Mechanisierung des Pappel-Stecklingseinschnittes. **[Mechanized cutting of Poplar cuttings.]** *Forst u. Jagd* 4 (12), 1954 (446–8). 1 ref. [G.]

Describes a machine equipped with a rotary knife for cutting Poplar shoots into suitable lengths, developed at the Poplar nurseries of Rosenburg, E. Germany. The cut is smoother than a scissor cut, resulting in a conservation of moisture in the cutting. In a dry spring successful takes were 80–90% for machine-cut and 40% for hand-cut material.

2766. PERRY, T. O., and WANG, C.-W. **Collection, shipping and storage of Slash and Loblolly Pine cuttings.** *J. For.* 55 (2), 1957 (122–3). 5 refs.

From experiments in the handling and shipping of cuttings from Australia to Florida and in the fruit and vegetable trade, a successful technique for carriage and storage is described. Cuttings are placed in a polyethylene bag with a loose mixture of dry sphagnum moss. A handful of moist sphagnum is put in one corner to keep the air moist. The sealed bag is perforated with 15–20 small holes and the bags are stored in a perforated box and kept as cool as possible. Success in grafting with scions stored in this way varies from 60 to 92% according to the season of grafting.

2767. LIDDICOET, A. R. **Humidity control unit for greenhouses and propagating beds.** *For. Res. Note Calif. For. Range Exp. Sta.* No. 112, 1956. pp. 3.

Consists of a circuit breaker and hygrograph hairs which elongate as humidity increases, allowing the circuit-breaker points to open and cut off the current and the valve controlling the mist. The unit can be regulated by adjusting the tension on the hairs. For propagating Pine cuttings 70–80% humidity is required.

2768. SNYDER, W. E. **Effect of photoperiod on cuttings of *Taxus cuspidata* while in the propagation bench and during the first growing season.** *Proc. Amer. Soc. hort. Sci.* 66, 1955 (397–402). 6 refs. E.M.B.

Under greenhouse conditions, lateral buds of dormant cuttings of *T. cuspidata* usually begin to break during late January or early February, regardless of whether the cuttings are inserted in November, December or January. The stimulation and inhibition of these lateral buds is shown by the experiments reported to be an effect of the photoperiod to which the cuttings are exposed. There was no significant effect of photoperiod on the rooting of cuttings or on the development of the root system during the first growing season. No correlation was found between rooting response and the degree of lateral-bud activity. Rooted cuttings in which lateral-shoot activity was inhibited by exposure to short-day treatment made significantly more growth during the growing season when subjected to either natural or long-day conditions than cuttings in which there was lateral-shoot growth during the propagation period. *From author's summary.*

2769. VIEITEZ, E. Problemas que plantea e estaquillado del castaño. **[Problems of rooting Chestnut cuttings.]** *An. Edafol. Fisiol. veg.* 15 (9/10), 1956 (629–59). 4 refs. [Span.span.e.] E.M.B.

Rooting of 1-year cuttings was successfully obtained with the aid of growth substances. Terminal shoots rooted more readily than basal shoots, and rooting was most vigorous in October and November. In most of the rooted cuttings no callus was formed. Success was obtained with the following treatments: (1) 4 mg./ g. each of indoleacetic and naphthylacetic acid, (2) 8 mg./g. naphthylacetic acid, (3) 4 mg./g. each of indolebutyric and naphthylacetic acid, (4) 8 mg./g. indolebutyric acid, (5) 12 mg./g. indolebutyric acid, and (6) 100 p.p.m. each of indoleacetic and naphthylacetic acid. Optimum treatment depends on the vigour of the cuttings. It is very important to maintain the correct temperature and moisture of the rooting medium.

2770. HOEKSTRA, P. E., and JOHANSEN, R. W. **Growth of planted Slash Pine air-layers.** *J. For.* 55 (2), 1957 (146).

One year after planting in a nursery, air-layers from 6-year-old Slash Pine had grown to 3½ times the height of those from 23-year-old trees. The marcottes from the younger stock had in general longer and more numerous roots.

2771. CHOUINARD, L. Essai de marcottage en l'air de *Betula papyrifera*, *Populus tremuloides*, *Larix laricina*, et *Abies balsamea*.] **[Trials of air-layering with *B. papyrifera*, *P. tremuloides*, *L. laricina* and *A. balsamea*.]** *Texte Conf. 36e Assembl. ann. Corp. Ingén. for. Québec* 1956 (47–53). 9 refs. [F.]

Experiments were made on 18 trees each of the 4 species, two marcottes being made on each tree. Roots were formed in 5 cases in Birch, 4 in Poplar, 1 in Larch and none in Balsam Fir.

2772. HOLST, M. J. **Phenology of rootstocks and grafts in a timing experiment with autumn and winter grafting of Norway and White Spruce.** *Tech. Note For. Br. Can.* No. 48, 1956. pp. 17. 4 refs.

Chilled and non-chilled White Spruce (*a*) and Norway Spruce (*b*) rootstocks were rated for their phenological behaviour. It was found that rootstocks placed in cold frames in November and thus receiving normal winter chilling were superior to non-chilled rootstocks with regard to health, shoot length and survival of grafted scions. (*a*) suffered more from lack of chilling than did (*b*). Foliage of non-chilled (*a*) discoloured to a dull yellowish-brown, while non-chilled (*b*) appeared quite healthy. Although (*a*) suffered most from lack of chilling, it started growth more quickly than did (*b*) after two different chilling periods. Both Spruces commenced shoot growth more quickly after long chilling than after short. Chilled scions grafted on non-chilled rootstocks showed better growth than those grafted on chilled rootstocks. Non-chilled plants had continuous root growth and cambial activity but retarded shoot growth. The difference in growth rhythm of the two Spruces is discussed and explained by the continental original of (*a*) and the oceanic origin of (*b*). *From author's summary.*

2773. HOFFMANN, K. Erfahrungen bei der Anlage von Samenplantagen. **[Experiences in establishing seed orchards.]** *Forst u. Jagd* 5 (5), 1955 (185–92). [G.]

First trials in grafting Pine and Larch in many E. German districts were disappointing, successful unions in the majority of cases being $< 10\%$ (25% at best). Further heavy losses occurred in transplanting 4- to 6-year-old grafted stock. Reasons for failure are discussed and recommendations made for improved techniques.

2774. HOFFMANN, K. Pfropfmethodische Untersuchungen im Freiland für die Anlage von Samenplantagen. **[Experiments in methods of open-air grafting for the establishment of seed orchards.]** *Züchter* 27 (1), 1957 (47–54). 14 refs. [G.g.] E.M.B.

A full version of a paper already published in abstract form. [See *F.A.* 18 No. 375.]

2775. VOGEL, P. DE. Het enten van berken. **[Grafting Birch.]** *Jaarb. Proefsta. Boomkwek. Boskoop 1954* [1955] (47–9). [Du.]

Results of grafting *Betula verrucosa* var. *youngii* on *B. verrucosa* and *B. pubescens* in different conditions are tabulated.

232.329. Miscellaneous (including Greenhouses, Frames, Raising in Pots, Tubes etc.)

2776. KAMP, J. R. **Container growing in the Midwest.** *Amer. Nurserym.* 104 (12), 1956 (10–1, 79–81).

In a nursery in Illinois, evergreen cuttings are removed from the cutting benches, set out in beds, and later transferred to small metal containers. They grow for 2 years in these and a year before sale are put into larger ones. The containers stand on asphalt, which makes weeding unnecessary, and the plants are watered and treated with water-soluble fertilizer by a permanent sprinkler installation. Fast-growing plants e.g. Arctic Blue Willow, are grown directly from cuttings in the small pots. Only one growing medium is used throughout, viz. a 60/40 mixture of fine peat and moulder's sand.

2777. WORSNOP, F. E. **The growth of zinc-sensitive tree seedlings in tinplate and galvanized iron tubes.** *Aust. For.* 19 (2), 1955 (74–86). 2 refs.

Following the poisoning of some species of tree and shrub seedlings in galvanized iron (g.i.) tubes used as substitutes for tinplate at the N.S.W. Forestry Department nurseries, a series of experiments was carried out at Cardiff, near Newcastle, and at Pennant Hills nursery, using *Callitris cupressiformis* seedlings. None of the expected chlorosis was found in a range of tube types with various coatings, and it was concluded that a concurrent change in Forestry Department procedure, involving the addition of lime, had been responsible for the disappearance of the trouble. Additional lime had further improved growth and even the addition of zinc corrosion products had not caused chlorosis. Despite a slight superiority of top growth in g.i. over that in tinplate at Cardiff, it was found that a minor and almost certainly unimportant reduction in root growth existed in g.i. tubes at both locations. It is concluded that g.i. tubes are suitable for all species, including those known to be sensitive to zinc, provided that some lime is used in the tubing soil. [Cf. *F.A.* 14 No. 3329.] *Author's summary.*

2778. MONJAUZE, A. L'enveloppe de polyéthylène, vecteur des racines et instrument d'étude du développement radiculaire. **[The polyethylene tube for nursery pots and root studies.]** *Publ. Serv. For. Algér.* No. 2, 1956. pp. 10 + 6 plates. [F.]

Describes and illustrates the nursery work and root systems arising from seed of *Eucalyptus cladocalyx*, *Cupressus sempervirens*, *Pistacia atlantica*, *Celtis australia* and *Stipa* sp. sown in these bags ('phytotrons'). The plastic, 0·04 mm. thick and partially permeable to air, attracts the roots, and suggests methods of root study where varieties of soil, impermeable layers etc. could be included. Bags 30 cm. long × 6 cm. can, when filled, be packed

780/sq.m. Details of field planting, now being worked out, will be reported. [Cf. *F.A.* 18 No. 1552.]

2779. **[Paper pots as containers for transplants in N. Rhodesia.]** *Colon. Res., Lond. 1955/56*, 1956 (97).

Treated paper pots were tested on a large scale as containers for transplants. Early results indicated that their use had led to an increase in the number of days upon which planting could be done successfully. The development of conifers in the pots was good but, for some unexplained reason, Eucalypts transplanted into pots suffered severe check.

2780. MATHUR, V. P. **Transplanting Teak in containers (*donas*).** *Proc. 8th silv. Conf., Dehra Dun 1951*, Part 2, 1956 (250–2). 4 refs.

A detailed account of the technique of transplanting Teak seedlings in leaf cups. [Cf. *F.A.* 13 No. 2077.]

232.33. Formation of Stands by Direct Sowing

See also Nos. 2730, 2754, 2761.

2781. KAUSHIK, R. C. **Problem of regeneration of high level conifers: regeneration of Deodar forests in Upper Bashahr.** *Proc. 8th silv. Conf., Dehra Dun 1951*, Part 2, 1956 (318–21).

Cedrus deodara reproduces itself with difficulty in this inner dry zone where there is little snow and long dry periods. After various unsuccessful experiments, a satisfactory technique has been developed of direct sowing in discontinuous, staggered contour trenches 1 ft. deep by 1 ft. wide, shaded with Deodar twigs, from which the needles fall and form a good mulch. The trenches also catch snow, which melts much later than surface snow.

2782. MARIAN, A., and ILIESCU, S. Rezultate privind semănăturile directe de molid din ocolul silvic Cîmpulung Moldovenesc. **[Direct sowing of Spruce in the Cîmpulung Moldova forest circle.]** *Rev. Pădurilor* 71 (4), 1956 (211–4). 6 refs. [Rum.russ.g.]

On the basis of experiments in direct sowing of Spruce [*Picea abies*] on the slopes of the Carpathians at an altitude of 900–1000 m., it is concluded that aspect and gradient of the site are important factors, best results being obtained on moderate, north-facing slopes. In the conditions obtaining in 1952–1954, satisfactory results were obtained only on semi-shaded aspects, but in 1955, when there was abundant rain and much cloud, good results were also obtained on western aspects. Broadcast sowing on snow or on bare soil was more successful than nest sowing. Beeting up to the extent of 15–20% is advisable 2–3 years after sowing. Sowing should be done on clear-cut areas not exceeding 10–15 ha. in extent, in order to get the benefit of lateral protection.

2783. HOOVEN, E. F. **Field test of tetramine treated Douglas Fir seed.** *Res. Note Ore. Bd. For.* No. 29, 1956. pp. 11.

A study undertaken to provide more information on the effectiveness of tetramine treatment. Although previous tests [cf. *F.A.* 16 No. 4036] were favourable, it was thought advisable to repeat them under controlled conditions before encouraging extensive operational projects. Four 10-acre plots were broadcast with a cyclone seeder at $\frac{1}{2}$ lb. Douglas Fir seed per acre. The plots, located near ridge tops so that all exposures were represented, were typical of the Tillamook Burn. Two were sown with tetramine-treated, and two with untreated seed. The seed was treated by soaking in a 1·0% tetramine/acetone solution for one hour. A study of the small mammals on these plots was begun before sowing in late 1953, and was continued until October 1954. The reduction in numbers of *Peromyscus maniculatus* was small and could not be directly related to the treated seed. In Oct. 1954, an examination of 100 one-milliacre sample plots per experimental plot indicated a stocking of 58·5% on the treated areas and 5·5 on controls. On the treated plots this high% represents the germination and subsequent survival of $\frac{1}{10}$ of the seed sown, ten months after broadcasting. *From author's summary.*

2784. STEIN, W. I. **Some lessons in artificial regeneration from southwestern Oregon.** *Northw. Sci.* 29 (1), 1955 (10–22). 9 refs. L.S.

Presents preliminary results of experiments to find a cheap and effective method of artificial regeneration other than planting. No method was found satisfactory for *Pseudotsuga taxifolia* (survival in plantings 50%, in sowings ca. 16%). *Pinus lambertiana* and *P. ponderosa* gave promising results when sown in unscreened spots, the sowing being done ca. 4 times as fast as planting. Autumn sowing is recommended, since seed treatment of any kind is unnecessary, protection from rodents less difficult, and growth begins immediately the favourable weather sets in.

2785. BALDWIN, H. I., and MURPHY, D. **Direct seeding White and Red Pine on cutover land.** *Fox For. Note* No. 66, 1956. pp. 1.

Seed of *Pinus strobus* and *P. resinosa* was sown on hoed spots in June 1955 on an area of *P. strobus* cut over in 1949. In October 51% of *P. strobus* spots and 30% of *P. resinosa* had one or more seedlings. Protection of seed-spots by conical screens made no difference to results.

2786. **Proceedings of the Southeastern Direct Seeding Conference, August 22–23, 1956, Savannah, Georgia.** Union Bag Camp Paper Corporation Woodlands Research Department, Savannah, Georgia. 1956. pp. 65. 28 refs.

A write-up of the papers and discussions, with chapters on recent experiments in direct sowing of Pines in the south-eastern U.S.A. selection of species, seed origin and supply, site preparation, time of sowing, protection, sowing techniques, study methods, costs and evaluation of results, with a select bibliography.

2787. JOHNSON, J. W. **Results of an empirical study of direct seeding.** *Woodl. Res. Note Union Bag Pap. Corp., Savannah* No. 2, 1956. pp. 2.

A successful trial of direct sowing of *Pinus*

elliottii on a burnt-over 'pond' (an area sometimes under water, but drying out in the summer) in Georgia, using an agricultural broadcast seeder, the Cyclone Seeder, and 2 lb. seed/acre.

2788. ACHTERBERG, H. H. Ermittlung von Pflanzenprozentwerten bei Weymouthskiefer und Lärche. **[The determination of plant percent in *Pinus strobus* and *Larix decidua*.]** *Arch. Forstw.* 5 (3/4), 1956 (243–57). 22 refs. [G.g].

Compares the plant % (survival at the end of one growing season) of 2 seasons' direct sowings when one provenance of Pine or Larch is sown in several localities or several provenances in one. Data cover maxima of 3 Pine and 32 Larch provenances and 4 and 6 localities respectively. Conclusions for the Pine are that: (1) seed must be protected, particularly from birds; (2) site factors, above all local climate, are important; (3) no direct relationship had been established between tested germination and the plant %; (4) neither preparation nor storage could be blamed for poor germination, the cause of which needs further study. For Larch, (3) and (4) also hold; low germination is due to empty seed; different provenances, except those of extreme climates, can be sown anywhere in the growth region; autumn sowings are inadvisable where pests are prevalent; seed is sensitive to incorrect treatment, e.g. sowing too deep. To cover climatic variations in such studies, tests should be reported for 10 years.

2789. MIROŠNIČENKO, JU. M. Ob uslovija vyraščivanija duba letnego [*Quercus robur*] v zapadnom Kazahstane. **[Conditions for rearing *Q. robur* in western Kazakhstan.]** *Bot. Ž.* 41 (11), 1956 (1667–72). 3 refs. [Russ.]

Observations were made in 1953 on the survivors of direct sowings of 1952, to determine the most favourable conditions for growing Oak in the droughty regions of W. Kazakhstan. Oak had been sown either (1) with alternate rows, planted at the time of sowing, of *Fraxinus pennsylvanica*, *Betula verrucosa*, or 'Small-leaved Elm' [*Ulmus pumila* var. *arborea*?] all spaced 1–5 m. from the Oak, or (2) pure, in rows spaced 3 m. apart. In all cases, the Oak was sown in seed-spots spaced 50 cm. apart. Data are presented on mechanical composition of soil, microclimate, the height and diam. growth and transpiration of the seedlings, mortality % after the winter of 1952–53 and the effect of position in the seed-spot on survival and growth. Some data are also included on the effect of density on survival in earlier sowings. Elm provided the best shelter; it grew quickly and its dense crown reduced wind velocity and transpiration. Recommendations made are that Oak should be raised by line sowings (not in densely sown seed-spots) with alternate rows of Elm at a distance of 4·5 m. Between the Elm and Oak, 2 intermediate rows of Apple, Pear, *Acer tataricum*, *Rhus cotinus*, *Lonicera tatarica* or *Ribes aureum* should be introduced.

2790. **[Direct sowing on recent burns.]** *Rep. Dep. Agric. Seychelles 1954*, [1955?] (12–3).

After promising results with direct sowing, it was decided when a 75-acre fire occurred at Dans Jamalac in February, to attempt immediate direct sowing of the whole area. A favourable circumstance was two days' heavy rain that cooled and saturated the ground immediately the fire was extinguished. *Sandoricum indicum* was the species mainly used. The work was completed by the end of March, holes at 4-ft. spacing being dug through the surface mat of half-burnt fern roots to the soil beneath. By the end of the year establishment averaged 85% and many plants were 3 ft. high in spite of a prolonged dry spell. The mulching effect of the fern roots seems to have been very beneficial; there was no competition from weeds, and no doubt the ash had a manurial effect. It seems clear that prompt direct sowing of burnt areas may often be the best and cheapest treatment and save them from erosion and sterility.

2791. SAN BUENAVENTURA, P., and ASIDDAO, F. **Progress report on air seeding tests.** *Filipino For.* 7, 1955 (61–4).

Experiments were made in sowing *Leucaena glauca* seed from a helicopter equipped with an improvised hopper, flying at 35–40 m.p.h. at an elevation of 100 ft. Sowing was done in strips along the contours. Results were promising, and costs reasonable (pesos 21·13/ha. using an Air Force helicopter). Hot-water treatment of seed accelerated germination by 1–2 days, but reduced germination %, and the swollen, sticky treated seed did not flow easily through the hopper.

232.4. Formation of Stands by Planting

See also Nos. 2716, 2719, 2813, 2862.

232.41. Planting Stock (Type, Handling and Treatment)

See also Nos. 2763, 2766.

2792. ACKERS, C. P. **Shortage of nursery stock.** *Quart. J. For.* 51 (1), 1957 (32–7).

The general principles that govern the growing and supply of forest trees for private woodland owners are discussed, and suggestions made for overcoming or ameliorating the present serious shortage in the U.K. The possibility of using one-year seedlings instead of transplants is put forward, and the examples of their successful use (particularly in the case of Larch) are adduced. Another suggestion is to use wilding stock.

2793. **The quality of Poplar plants.** *Leafl. For. Comm., Lond.* No. 39, 1956. pp. 8. Price 6*d*.

Describes different types of planting stock (1-year rooted cuttings, ditto stumped and transplanted for 1 year ($C_1 + S_1$), $C_1 + S_2$, and unrooted setts), and methods of raising and handling them.

2794. SINGH, B. **A technique of pre-treatment of stumps before planting in Madhya Bharat.** *Proc. 8th silv. Conf., Dehra Dun 1951*, Part 2, 1956 (152–4).

The high temperatures and short rains give a very short growing season in this area, and in order to take full advantage of it, stumps are prepared in Feb. or March, their roots puddled with loam and then wrapped in grass, and the prepared stumps then stored vertically under light shade and watered daily

until the rains break in the middle of June, by which time they have developed shoots and leaves and are ready to start growing as soon as planted. Figures are given for costs of treatment and for survival and growth of treated and untreated stumps.

2795. SNYDER, W. E., and HESS, C. E. **Low temperature storage of rooted cuttings of nursery crops.** *Proc. Amer. Soc. hort. Sci.* 67, 1956 (545–8). E.M.B.

Rooted cuttings of *Juniperus communis* var. *hibernica, Thuja occidentalis* var. *pyramidalis* and *T. occidentalis* var. *globosa* stored in closed polyethylene bags at controlled low temperatures (31, 35 and 39° F.) did not grow as well as those potted and kept in the greenhouse; but rooted cuttings of *Taxus cuspidata* similarly stored at 39° F. produced at the end of the first growing season plants comparable to the controls. *From authors' summary.*

2796. KLÍR, J. Konservování sazenic v době jarní výsadby. [**Storage of plants during spring planting.**] *Lesn. Práce* 35 (3), 1956 (122–8). [Cz.]

Illustrated description of different types of 'snow dug-outs' (Czechoslovak Standard No. ČSN 482361: Snow dug-outs in forestry) used in Czechoslovakia for the cold storage of plants to delay flushing.

2797. COLUMBRES, E. L. **Storage qualities of Paper Mulberry (*Broussonetia papyrifera* Vent.) seedlings under different packing media.** *Filipino For.* 8, 1956 (104–5).

Tests were made on 460 seedlings, ca. 8½ months old and averaging 17 cm. high. Seedlings of this age and size can be kept without loss for 10 days if packed in leafmould, rice husks, or sawdust, soaked in water and then wrapped in gunny sack.

2798. PETRAČIĆ, A. Vitalitet sadnica sofore (*Sophora japonica* L.) (uz poseban prikaz vitaliteta različito odraslih sadnica). [**Vitality of *S. japonica* planting stock (with special reference to the vitality of plants of different development).**] *Glasn. šumske Pokuse* No. 12, 1956 (5–11). 2 refs. [Croat.g.]

Presents results of trials with 1900 one-year-old Sophora plants (height 20–60 cm., diam. near collar 3–10 mm.) lifted in April; 100 were transplanted directly from the nursery beds, the rest were left (*a*) fully exposed to sunshine and weather (900 plants), or else (*b*) in a shed with the door ajar (900 plants), and every day 100 plants from both (*a*) and (*b*) were put into the transplant bed. The plants were graded by size, as strong, average, or weak, and the figures of survival in October were tabulated for each batch and grade. Averaging the grades, the (*a*) batches dropped from 92 to 13% and the (*b*) from 73 to 5% as against 99% for the direct transplants. Referring to a previous communication (*Glasn. šumske Pokuse* 5, 1937), the author concludes that the vitality of young *S. japonica* plants is about the same as that of *Quercus pedunculata, Q. sessiliflora* and *Ulmus campestris*, higher than that of *Acer pseudoplatanus* and *Fagus sylvatica* plants, but lower than that of *Robinia pseudoacacia, Fraxinus excelsior* and *F. americana.*

2799. GUTSCHE, H. J. Eine Pflanzenlade. [**A plant carrier.**] *Forst- u. Holzw.* 12 (5), 1957 (78–9). [G.]

Describes a metal tray, 45 × 30 × 20 cm., with a carrying handle. Sloping side-walls, and cutting down one of the long walls to a height of 10 cm., facilitate packing and removal of plants. A foam-rubber cover on bottom, walls and the two adjustable partitions make it easy to keep clean.

232.42. Methods of Planting (including Use of Fertilizers etc.)

See also No. 2819.

2800. HEYDEN, D. Pflanzhacken. [**Planting mattocks.**] *Forstarchiv* 27 (9), 1956 (216). 1 ref. [G.]

Five German makes of mattock are described and illustrated. The Wiedehopfhaue, Reissinger, and Baak makes are suitable for all planting operations. The Münch mattock is specially designed for slant planting, the Harz mattock for preparing the soil before planting.

2801. KAMINSKY, G. Pflanzlochbohrer. [**Planting-hole borers.**] *Forstarchiv* 27 (1), 1956 (24). [G.]

Details are given for 6 German makes of mechanical borers, including diam. of borer, depth of hole, weight, labour required, holes made per hour and price.

2802. HEYDEN, D. Hohlbohrer und Hohlspaten. [**Semi-circular and concave spades.**] *Forstarchiv* 27 (11), 1956 (264). [G.]

Illustrations and technical details and prices are given for 8 types of spade for making planting-holes. The Mantel and Schleifer semi-circular spades are for normal soils, the Jansen is specially suited to mountain conditions, and the Kelheimer is designed for planting Fir and Spruce.

2803. ANDERSON, K. **An improved device for planting tree seedlings.** *J. For.* 55 (3), 1957 (215–6).

Describes with illustrations the Gorecki double tractor tree-planting bar. It is attached to the wheel of a tractor and will fit any make or size. On a 4-ft. wheel it makes holes 4 in. wide and 10 in. deep at 6-ft. intervals by means of sharp extension blades, and averages 1000 holes/hour.

232.43. Spacing and Arrangement in Plantations

See also No. 2836.

2804. SMITH, L. F. **Early returns from a Slash Pine plantation [in S. Mississippi].** *Sth. Lumberm.* 193 (2417—Christmas No.), 1956 (212–3).

First inventory data on stands planted 15 years ago on cut-over Longleaf Pine sites and old fields at different spacings. Diameter growth on the widest exceeded that on the closest spacings by ca. 2 in., but b.a., cordwood production and financial returns were generally highest at the closer spacings. Early mortality and fusiform-rust infection were heavy on all plots. [Cf. *F.A.* 18 No. 760.]

2805. **The effect of very close initial spacing on the growth of *Pinus radiata*.** *Rep. For. Timb. Bur. Aust. 1955*, 1956 (25).

An experiment established in an old nursery in 1940 to determine the effect of heavy initial stocking on subsequent growth of the stand was measured during 1955. One half of the nursery was thinned in 1940, 1943, and 1952. The unthinned half originally carried 6000 trees/acre. In 1955, the position of the two plots was as follows (figures for thinned plot in brackets): stems/acre 1394 (448), b.a./acre (sq. ft.) 368 (285), total u.b. vol./acre (cu. ft.) 10,063 (7966), merchantable u.b. vol. to 4-in. top 8090 (7434). When thinnings are included, the total volume production of the thinned plot exceeded that of the unthinned by 6·2% and the merchantable volume by 5·6%, which is not regarded as significant. The d.b.h. of the 300 largest trees per acre averages 11·8 in. in the thinned and 9·9 in the unthinned plot.

2806. **[Effect of initial spacing on growth of *Pinus radiata*.]** *Rep. For. Timb. Bur. Aust. 1955*, 1956 (29).

Studies of growth at different initial spacings have been maintained in *P. radiata* stands. Some conclusions drawn in low-quality stands at 15 years are as follows: (1) Although total volume/acre is a rectilinear function of spacing, a quadratic equation is indicated for the regression of vol. to 4 in. u.b./acre on spacing, with a probable trend towards a rectilinear relationship as age increases. (2) The straight-line regression of taper on spacing may be merely a corollary of that of mean d.b.h. on spacing. (3) Current annual increment of b.a. is not independent of b.a./acre except for a brief period, between 12 and 14 years, when the slope of this regression is reversing.

2807. LOWRY, A. L. **Sitka Spruce at Bachelors Lodge.** *Irish For.* 13 (2), 1956 (70–1).

A note on growth at 16 years of Sitka Spruce planted in cleared woodland at 9 × 9 ft. spacing. Average q.g.b.h. is 6 in., average height 28 ft., vol. o.b. 1213 Hoppus ft./acre.

232.44. Season and Time of Planting

2808. B. Sofortkulturen auf frischen Schlagflächen. **[Immediate replanting of clear fellings.]** *Holz-Zbl.* 83 (37), 1957 (502). [G.]

Discusses possible advantages, financial and silvicultural of replanting conifer sites in the spring following a final felling, and the organization and timing of logging work, including slash disposal, to make this possible.

2809. GRIFFITH, A. L. **The best date of planting softwoods at Muguga (Kenya).** *Emp. For. Rev.* 36 (1), 1957 (94–7). 2 refs.

Experiments were made to determine the best planting time in a climate where planting is often endangered by an early break in, or a premature end to, the rainy season. A brief description of the locality, and data on the annual rainfall are given. In March, April and May of 1952 and 1953, three plantings of 100 plants each were made at an interval of 3 weeks, and from 1954 to 1956 ten weekly plantings of 100 plants each were made with *Pinus patula* and *Cupressus lusitanica*. During the months of planting, a daily rainfall record was kept and evaporation was estimated roughly from the air temperature. Results were assessed in each case after the first year of planting. In all experiments seedlings in the earlier plantings had the greater height growth and most sturdiness and vigour. The increase of height growth with early planting is greater in a dry than in a wet year, and is more for *P. patula* than *C. lusitanica*. For the best results at Muguga, planting should not be before 15 March, the rainfall build-up should be ½–1½ in. and the depth of soil wetting 2–3 in. for *P. patula* and 1½–2 in. for *C. lusitanica*.

232.5. Artificial Formation of Stands by Vegetative Propagation

2810. **[Direct planting of *Mitragyna stipulosa* cuttings on a reed swamp.]** *Rep. For. Adv. Gambia 1954*, 1956 (5).

A trial planting of 3 acres of *M. stipulosa* cuttings was made on a reed swamp, in an attempt to demonstrate that this species is capable of growing on such sites, but does not normally do so because weed growth smothers the natural seedlings. Of 3000 cuttings planted, only 120 were alive at the end of the year, but this may have been due to exceptionally heavy rains causing the level of the swamp to rise higher and for a longer period than usual. In these conditions, the surviving plants had rooted in the water and not in the mud, the whole length of the cutting below ground having rotted away down to the xylem. When the water level drops, the roots are exposed to the air, but when last seen they appeared to be growing down after the water. It appears to be important to maintain the thick growth of reeds at this stage in order to shade the aerial roots.

233. Afforestation

See also Nos. 2403, 2418, 2437, 2444, 2446, 2597, 2734–6, 2810, 3039, 3227, 3619.

2811. GRUNEIL, T. DE. **A note on peat afforestation with special reference to work carried out in Cloosh Valley, Connemara.** *Irish For.* 13 (2), 1956 (64–8).

On the basis of his own experience, the author's recommendations for establishing a tree crop on Connemara peat are: (1) drain intensively and prepare ground 6 months to a year before planting; (2) plant 1 + 1 *Pinus contorta*, 2 + 1 *Picea sitchensis*, 1 + 1 broadleaved species; (3) apply ground mineral phosphate immediately after planting, at a rate of 3 oz./plant for Spruce and Birch and 1 oz. for Pine.

2812. DARMER, G. Zur forstlichen Rekultivierung schwieriger Kippenböden im Braunkohlentagebaugebiet. **[The revegetation of difficult spoil-mound sites in the open-cast lignite mining region.]** *Forst u. Jagd* 5 (3), 1955 (117–21). 4 refs. [G.]

A general article, dealing chiefly with the preparation of acid sites by liming and the use of various soil-forming and soil-improving pioneer species, both woody and non-woody, stressing the responsibility of the mining authorities for careful handling of topsoil and parent material, and warning against premature planting of forest species.

2813. MÖRMANN, P. Anbaumöglichkeiten und Anbautechnik der Schwarzkiefer (*Pinus nigra* var. *austriaca*) in Nordbaden. [**The possibilities and techniques of afforestation with *P. nigra* var. *austriaca* in N. Baden.**] *Allg. Forst- u. Jagdztg.* 128 (2/3), 1957 (33–9). 14 refs. [G.g.e.]

Describes some of the 1345 ha. of poor and derelict farm land scheduled for afforestation in a 6-year relief programme for the Odenwald region. Austrian Pine, of which ca. 100 ha. aged 50–80 exist in the region, is considered the most suitable pioneer for the frequently shallow, stony and dry sites on Triassic shell limestone, with an annual precipitation of 550 mm. Various techniques used locally, in Central Germany, Austria, and elsewhere are discussed, including hole, trench and particularly notch planting. On most sites, planting 2-year-old seedlings or transplants is preferable to sowing.

2814. OESTERREICH, H. Folgen der Kiefernaufforstung auf den Höhen im nördlichen Harzvorland. [**The consequences of afforestation with Pine on the northern foothills of the Harz mountains.**] *Forst u. Jagd* 4 (11), 1954 (404–6). [G.]

Describes severe erosion following the Pine's suppression of the ground vegetation—chiefly xeric grasses—particularly on dry, steep slopes on S. aspects. After clear felling, severe erosion was also found on hill tops and easier slopes.

2815. BOURGENOT, L. Étude et comparaison de deux boisements artificiels du premier plateau du Jura datant de 1885: Conliège et Orgelet. [**Comparison of two plantations on the first plateau of the Jura dating from 1885: Conliège and Orgelet.**] *Rev. for. franç.* 9 (3), 1957 (188–203 + 2 photos). 1 ref. [F.]

Both plantations were made on waste land, that at Conliège on clay-with-flints, and that at Orgelet on a calcareous soil. Planting was done with a mixture of Scots Pine, Norway Spruce and broadleaved species. The great superiority of the plantations on clay-with-flints is clear [cf. *F.A.* 18 No. 1239], yields being consistently higher. The economic superiority of Spruce over Pine is also brought out.

2816. OVERDIJKINK, G. A.; WILMES, L. W. Beplantingsplan en uitvoering van de beplanting in de Noordoostpolder. [1] Het landschapsplan en het algemene beplantingsplan. [2] De aanleg van de beplantingen en de boscomplexen. [**The plan for planting on the N.E. polder and its execution. [1] The landscape plan and the general plan for plantings. [2] Planting and the establishment of forests.**] *Van Zee tot Land, W. E. J. Tjeenk Willink N.V., Zwolle* No. 9, 1953. pp. 66. 12 refs. [Du.du.e.] Price *Fl.*2·90.

[1] A general account of the plan for the harmonious lay-out of the countryside, for plantings along roads, round farms etc., and for the establishment of forests at Voorst (675 ha.), Kuinre (1025 ha.), Urk (125 ha.) and to the west of Schokland (70 ha.). [2] A detailed account of (*a*) the roadside plantings, in single lines or in the form of shelterbelts, species (mainly *Populus* spp., with *Acer campestre*, *Carpinus betulus*, *Quercus robur*, *Crataegus monogyna*, *Salix* spp., etc.), planting methods and spacing, and the amount planted; (*b*) farm plantings (shelterbelts and hedges) with information on site preparation, choice of species etc.; (*c*) village plantings; and (*d*) afforestation of the areas set aside for forest, giving details of their geology, draining, site preparation, and choice of species. Oak, Ash, Hornbeam, Sycamore Maple and Beech are the principal species on boulder clay, conifers on the sands, and Sitka Spruce, Ash and Sycamore Maple on the peat soils. Three nurseries with a total area of 65 ha. have been established.

2817. PRENTICE, A. **Re-afforestation in Greece.** *Scot. Geogr. Mag.* 72 (1), 1956 (25–31 + 1 photo). 4 refs.

Describes present condition and history of Greek forests and gives some account of the progress of afforestation, difficulties involved, and future programmes.

2818. HEBB, E. A. **Regeneration in the sandhills.** *J. For.* 55 (3), 1957 (210–2). 2 refs. [Cf. *F.A.* 17 No. 2758.]

2819. [**Establishment of plantations on the arid coast of Somaliland.**] *Colon. Res., Lond. 1955/56*, 1956 (103).

A method has been developed for establishing *Conocarpus lancifolius* on the arid coast of Somaliland, with only ca. 2 in. annual rainfall, but with groundwater. A rock-like gypsum layer occurs at 6–18 in. below the ground surface, and this has to be broken with crow-bars. A hole 4–6 ft. deep is then dug, down to the water table, for each plant. Striplings long enough to stick out of the holes are planted at the bottom. The holes are not filled in, but this occurs naturally by windblown sand in a year or so, by which time the trees are established. Initial success (95% germination and survival after 2 years) has been obtained with the Dom Palm (*Hyphaene thebaica*) in the same locality. The seeds are sown direct in pits, which are kept free of blown sand until the plant has developed enough to escape being covered.

2820. MULLICK, S. P. **Coastal plantations and technique of sand fixation on the coasts of Midnapore district [W. Bengal].** *Indian For.* 83 (2), 1957 (97–100 + 6 photos).

Describes the methods employed in fixing these extensive sand-dunes, with some indication of costs. *Casuarina equisetifolia* is the species principally used, and when it is established it is sometimes underplanted with Cashewnut [*Anacardium occidentale*] and Tan Wattle (*Acacia auriculiformis*).

2821. **Afforestation scheme for the laterite zone, Southern Circle [W. Bengal].** Forest Directorate, Government of West Bengal, Calcutta. 1956. pp. 30.

Detailed instructions for carrying out the technique that has been developed for afforesting laterite soils, especially eroded slopes, with *Shorea robusta* and other valuable species.

2822. BHARGAVA, O. P. **An experiment to afforest alkaline areas in Madhya Bharat.** *Proc. 8th silv. Conf., Dehra Dun 1951*, Part 2, 1956 (103–6). 3 refs.

The salinity of these soils is connected with waterlogging due to pan formation. Experiments have been made in planting or sowing on raised mounds or ridges. Direct sowing of *Acacia arabica*, *Prosopis juliflora* and *Melia indica* on raised lines, with cross drainage and frequent soil working, are recommended for these areas.

2823. MALHOTRA, K. C. **Reclamation and afforestation of water-logged areas.** *Proc. 8th silv. Conf., Dehra Dun 1951*, Part 2, 1956 (78–82).

Describes the very large areas of waterlogged land that occur in the Punjab as a result of a cumulative rise in the water-table due to long-continued canal irrigation, seepage from canals etc. These soils also become highly saline. Treatment consists of drainage and pumping to relieve the first condition and leaching out the salts by application of large quantities of water. A list is given of suitable tree and shrub species for planting on raised mounds or ridges on waterlogged sites (all heavily transpiring species). Some account is given of works in progress.

2824. AGARWALA, V. P. **Five-year plan plantation activity in Ramnagar forest division, Uttar Pradesh.** *Indian For.* 83 (1), 1957 (12–22 + 12 photos, 1 map).

Among the outstanding features of recent work are the size of the plantations (up to 670 acres), mixture of useful species, and use of a special porcupine-and-game-proof fence. Tabulated data are given on the growth of 29 species including several exotics.

2825. **[Planting in *lalang* and on tin tailings.]** *Rep. For. Adm. Malaya 1955*, 1956 (15–6 + 2 plates).

A 20-acre plantation of *Albizzia falcata* in fire-protected *lalang* [*Imperata cylindrica*] continued to thrive; other species showing promise are *Araucaria cunninghamii*, *Pinus caribaea*, *P. insularis* and *P. merkusii*. *Eucalyptus multiflora* and *Melaleuca leucadendron* are showing promise on tin tailings.

234. Formation of Forest by Natural Succession

See Nos. 2629–30.

235. Underplanting, Advance Planting etc. Nurses and Formation of Mixtures. Interplanting of Inferior Growth

See also Nos. 2405, 2706, 2708, 2712, 2789.

2826. MEADE, F. M. **Converting low-grade hardwood stands to conifers in the Arkansas Ozarks.** *Bull. Ark. agric. Exp. Sta.* No. 551, 1955. pp. 26. 7 refs.

Pinus taeda, *P. echinata* and *Juniperus virginiana* were planted on experimental plots in mixed hardwoods under different degrees of overstorey. *J. virginiana* was unable to compete with hardwoods in any conditions. *P. taeda* did better than *P. echinata*. Survival of Pines was not significantly affected by amount of overstorey. Cleaning would be necessary to release Pine from hardwood regrowth and weeds.

2827. **[Underplanting with *Widdringtonia whytei*.]** *Colon. Res., Lond. 1955/56*, 1956 (99–100).

On Zomba plateau, Nyasaland, 3 acres of indigenous evergreen forest and ¾ acre of *Pinus patula* have been underplanted with Mlanje Cedar [*W. whytei*] in order to determine the possibility of converting poor patches of evergreen forest to Cedar, and the effect of underplanting exotic Pine stands with an indigenous conifer. The growth of Cedar planted in cleared rows within a 4-year-old *P. patula* stand is exceptionally good and provides an interesting comparison with plots of the same species planted in the open without shelter or side shade. Growth is faster and the young trees are taller, straighter, and less branchy.

2828. PEŘINA, V., and PEŠKA, R. K používání olše jako přípravné dřeviny. **[The use of Alder for advance planting.]** *Lesn. Práce* 35 (4), 1956 (148–52). 1 ref. [Cz.]

Presents results of measurements made in trials with *Alnus glutinosa* on diluvial sands. After 6–10 years, the soil under Alder was found to be no richer in N, which is explained by its poor and deformed root growth on the dry, poor soil. In order to make Alder cover the soil efficiently, it had to be cut at ca. 20 cm. above ground: when cut higher or lower, it generally put out a single straight shoot, without branches. If properly cut, Alder, particularly in mixture with Spruce, caused a marked increase in soil N content and a decrease in acidity, especially when fertilizers were used. However, on account of its high transpiration rate (800–900 mg. water/1 g. of leaf mass), it should be used in mixture with Spruce.

236. Care of Regeneration or Plantations in the Initial Stages of Establishment

See also No. 3113.

2829. **[Weeding of *Khaya senegalensis* and *Gmelina arborea*.]** *Rep. For. Adv. Gambia 1954*, 1956 (5–6).

An experiment has been made on first-year weeding of *K. senegalensis* and *G. arborea*, planted at 7 × 7 ft. spacing. The treatments were: (*a*) cutting all the grass and mulching the plants with it, (*b*) cutting all grass and leaving it, (*c*) control (no treatment), and (*d*) hoeing. There was no significant difference between (*a*) and (*b*) with *G. arborea*, but (*b*) was definitely superior to (*a*) with *K. senegalensis*. With both species, (*d*) did more harm than good, growth and survival being inferior to (*c*). Treatments (*a*) and (*b*) cost ca. 35*s.*/acre and the difference in survival between these and (*c*) could be made good by beeting for ca. 8*s.*/acre. It is doubtful whether the average extra 8 in. in first-year growth obtained by these treatments is worth the cost.

237. Amelioration of Forest Sites

See also Nos. 2429, 2811–2.

2830. LUKKALA, O. J. **On swamps and forest drainage work in Finland.** *Finnish Paper and Timber, Helsinki* 9 (9), 1956 (99–101). [E.]

A brief account of past work, areas involved, methods of assessing and selecting areas for drainage, techniques, and effects on tree growth. [Cf. *F.A.* 17 No. 2782.]

2831. FABRICIUS, L. Bodendeckung mit Pflanzenstoffen. **[Mulching.]** *Forstwiss. Cbl.* 75 (1/2), 1956 (2–8). [G.]

In 1929 five trial plots, each of 180 sq. m. mixed Pine and Spruce, were established and given the following treatments: (1) control—left undisturbed; (2) heather and all other ground vegetation uprooted and removed; (3) as (2), but the uprooted ground vegetation left lying, and that of (2) added to it; (4) ground vegetation uprooted and left lying; (5) all ground vegetation left standing and considerable quantities of cut vegetation (mainly heather) brought in and left lying. In September 1955 measurements of height and diameter were taken. The results showed a marked superiority in growth in plot 5, the difference being greater for Spruce than for Pine.

2832. WITTICH, W. Grundlagen und Aussichten der Düngung im Walde. **[Fertilizers in forestry: fundamentals and prospects.]** *Ber. Tag. nordwestdtsch. Forstver., Braunschweig 1955*, [1956] (5–15). [G.]

A discussion of the complexity of soil chemistry and nutrition problems. Despite the dearth of reliable information from fertilizer trials, apart from amelioration of degraded sites, the author considers beneficial effects to be proven, particularly for the nutrient-deficient sands of N. Germany.

2833. WARING, H. D. **The establishment of fertilizer field experiments in forestry.** *Aust. For.* 19 (2), 1955 (117–20).

Describes the lay-out of a trial to test 6 elements (B, Cu, Ni, Zn, Mo, Mg) on a basal treatment of N, P, K, using a half-replicate factorial design with 32 plots 1 chain square. There are so many difficulties and so much additional expense associated with well designed forestry field experiments compared with agricultural, that there is a tendency to economize by cutting down on treatments and replications. It is better to eliminate some treatments by preliminary experiments and then test likely treatments by adequate field trials.

2834. MCGREGOR, W. H. D. **Fertilizer increases growth rate of Slash Pine.** *Res. Note Stheast. For. Exp. Sta.* No. 101, 1957. pp. 2. 1 ref.

Of 40 twelve-year-old Pines of 9–14 in. diameter on fine sand in an old field, one-half received fertilizers 3 times a year for 4 years at 500 lb. N/acre/year plus varying amounts of P, K, and minor elements. Growth for this period and the previous 4 years was measured on the trees after felling. Mean volume growth, adjusted for differences existing before treatment, increased by 36·6% over controls. Mean resin yields increased by 23%. [Cf. *F.A.* 15 No. 3592.]

2835. HARTMANN, F. K., JAHN, G., and KLAEHN, F. U. Untersuchungen über die Wirkung der Kalkdüngung auf die Bodenflora. **[The effect of liming on ground vegetation.]** *Forsch. u. Berat. (Forstw.) Landesaussch. landw. Forsch. Landes Nordrhein-Westfalen* No. 2, 1956 (33–40). [G.g.]

A preliminary report on investigations in Nordrhein-Westfalen on (*a*) Spruce stands with a soil cover almost entirely raw humus, (*b*) Beech stands on superficially degraded soils without natural regeneration, and (*c*) checked Spruce plantations on former clear fellings with unfavourable ground vegetation. Two to three years after liming, increased vegetation of a more nitrophilous type than the isolated mosses on controls was noticeable on (*a*), a denser and more varied vegetation, including more Beech seedlings, on (*b*), and no effect on (*c*).

238. Timber Plantation Crops requiring Special Treatment

2836. BAUER, F. Die Aufbringung von Pappelfaserholz. **[The production of Poplar pulpwood.]** *Holz-Zbl.* 83 (36), 1957 (481–3). [G.]

Deals with potential and existing plantations in W. Germany, stressing the technical needs of manufacturers for a steady supply of homogeneous material rich in cellulose content (but considers differences between varieties unimportant). Spacing and thinning are discussed chiefly from the economic angle, favouring an original spacing of 4–5 m. and including questions such as thinning by contractors and barking by producer or mill.

2837. Exposés nationaux sur les politiques suivies en matière de populiculture. République Argentine. **[Statements by individual countries on Poplar cultivation policies. Argentina.]** [*Docum.*] *FAO Latin Amer. Poplar Conf., Buenos Aires 1956* No. *FAO/CIP/LAPC/3-A*, 1956. pp. 11. [F.] Limited distribution.

There are two distinct types of Poplar and Willow plantation in Argentina: (1) on sites near water, and (2) on dry sites. The principal plantations are found in the Paraná Delta. The report gives information on the behaviour of different species, plantation techniques, increment, pests and diseases, and economics.

24. Tending of Stands and Trees

See also Nos. 2688, 2862.

242. Thinnings

See also Nos. 2582, 2805, 2836, 2846, 2960, 3203, 3233, 3310.

2838. O'KELLY, P. F. **Some considerations in connection with the thinning of conifers in Ireland.** *Irish For.* 13 (2), 1956 (52–64).

A general, theoretical discussion of the types of thinning advisable in Irish conditions.

2839. KÜNANZ, H. Die Durchforstungen und ihre Auswirkungen auf Massen- und Wertleistungen der Bestände. **[The effect of thinning on volume and financial yields.]** *Allg. Forst- u. Jagdztg.* 128 (2/3), 1957 (53–63). 26 refs. [G.e.]

A general article based on German literature, with some data on the effect of heavy crown thinning on Beech forests in Hesse, where it has been practised for 50 years.

2840. LÜTKEMANN, J. Neuere Erkenntnisse in der Durchforstungsfrage und ihre Berücksichtigung in der Praxis. **[Recent findings on the thinning problem and their practical application.]** *Allg. Forst- u. Jagdztg.* 128 (2/3), 1957 (39–53). 39 refs. [G.g.e.]

A survey of recent German literature summarizing the results of thinning experiments for Beech, Pine, Spruce, and Oak.

2841. VYSKOT, M. Rozbor úrovňové a podúrovňové probírky ve smrkovém porostu na Šumavě. **[Analysis of thinnings from above and thinnings from below in a Spruce stand on the Šumava Mts.]** *Sborn. čsl. Akad. zeměd. (Lesn.)* 29 (2), 1956 (81–134). 120 refs. [Cz.cz.russ.g.]

A detailed study of stand structure in a 45-year *Picea abies* stand, with 7% Birch and 3% Scots Pine, at the foot of Mt. Boubin. The stand structure is shown in graphs and tables for diameter, height class and quality of tree before and after thinning (*a*) from above, and (*b*) from below. The c.a.i. and m.a.i. of 11 dominant and 12 suppressed Spruce are compared graphically for diameter, b.a., height and volume. Short-term readings are also reported for (1) evaporation at 1·5 m., and (2) illumination at 1·3 m., for each thinning and the control.

2842. DOSEN, R. C., STOECKELER, J. H., and KILP, F. G. **Mechanized thinning in Jack Pine saplings.** *J. For.* 55 (3), 1957 (201–4).

In central Wisconsin, 2540 acres of Jack Pine saplings were thinned with the self-propelled 26-in. Lowther General Purpose circular saw. Portable 8- to 10-in. circular or chain saws were used to cut the brush and correct the spacing. Thinning by mechanical means reduced costs by 50–60% as compared with hand thinning. The Lowther saw was preferred to a larger saw or an Athens disc because it can be used selectively, it is worked by one man, and will cut stems 6 in. in diameter.

2843. SPURR, S. H., YOUNG, L. J., BARNES, B. V., *et al.* **Nine successive thinnings in a Michigan White Pine plantation.** *J. For.* 55 (1), 1957 (7–13). 12 refs.

In the Saginaw Forest a stand of *Pinus strobus* planted in 1904 was divided into two blocks. In each block two permanent sample plots of ca. ¼ acre were established on (*a*) a thinned and (*b*) an unthinned portion of the block. The first thinning in Block A was carried out in 1915 and 8 subsequent thinnings at 5-year intervals were made by the crown-thinning method. Block B was first thinned in 1920 and thinnings at 5-year intervals were made by the low-thinning method varying from A to C grades. Computing techniques and methods of analysing the data are described; a statistical summary and comparison of the two blocks from 1916 to 1955 are given and data on the severity of the thinnings tabulated. These were in both cases too light to make any appreciable difference in gross volume m.a.i. and only slightly improved bd. ft. volume and b.a., but crop trees average 0·6 in. more in d.b.h. and are healthier.

2844. MALAC, B. F., and JOHNSON, J. W. **Cook tract thinning study, Slash-Longleaf Pine stands.** *Woodl. Res. Note Union Bag Pap. Corp., Savannah* No. 1, 1955. pp. 2.

Results for the first 5 years of a study on thinning treatments in a 20-year-old mixed stand. An improvement thinning gave highest total volume production over the period; thinning from below gave greatest increase in b.a. increment.

2845. STEELE, R. W. **Thinning nine-year-old Douglas Fir by spacing and dominance methods.** *Northw. Sci.* 29 (2), 1955 (84–9). 1 ref. L.S.

Early thinning in 9-year Douglas Fir produced taller and larger trees than no thinning, and reduced the time required for stands to reach merchantable size. Thinning did not appreciably influence total cubic volume at the age of 42 years. There was some evidence that thinning for dominance is superior to thinning for spacing. The trees in the thinned stands were taller than those in the unthinned, indicating that height growth was noticeably affected by tree density. When trees as young as 10–15 years are used for Christmas trees, thinning dense sapling stands of this age may be economic.

243. Opening of the Canopy (Increment Fellings, Overhead Release and Improvement Fellings)

See also section 441.

2846. MURPHY, D., and BEAVEN, D. **Costs of thinning young hardwood.** *Fox For. Note* No. 65, 1956. pp. 1.

A comparison is being made of costs and effectiveness of thinning young hardwoods by (*a*) poison girdling, (*b*) insertion of poisoned tabs in bark, and (*c*) felling with axe. The respective expenditure in man-hours/acre was 18·5, 13·5, and 22·5. Treatment (*c*), of course, provided immediate release, (*b*) had had little effect after 2 months, and (*a*) caused leaves to wither within a few days.

2847. CURTIS, R. D. **Estimating cost of improving Adirondack timber stands by killing culls with frills and sodium arsenite.** *For. Res. Note Ntheast. For. Exp. Sta.* No. 63, 1956. pp. 4. 2 refs.

Two methods of estimating costs are given, based on experience since 1951; (*a*) by b.a. treated per acre, (*b*) by average size and number of trees treated per acre. Details of costs in man-hours and necessary amounts of poison are tabulated, for (*a*) and general formulae given for (*b*).

2848. PLASS, W. T. **Killing hardwoods with herbicides in Southeastern Ohio.** *Sta. Note Cent. St. For. Exp. Sta.* No. 98, 1956. pp. 2.

Reports on limited tests with commercial formulations and dosages of esters of 2,4,5-T (in frills) and 2,4-D (band-girdles) and with Na arsenite tabs [cf. *F.A.* 16 No. 4087] on White and Red Oak of 12–30 in. d.b.h. The 2,4-D was the most effective, but no treatment proved lethal. The tabs, averaging 6 per tree with ½ oz. arsenite per tab, killed only one tree and were very expensive. Costs are given.

2849. SHIPMAN, R. D., and SCOTT, H. R. **Chemical control of small-diameter scrub-Oak.** *Sth. Lumberm.* 194 (2422), 1957 (64, 66).

Treatments tested on 3-year sprouts of *Quercus laevis* in Pine plantations in the Carolina-Georgia sand-hills were: (1) 2,4,5-T as (*a*) basal, (*b*) stump spray, and (2) Ammate (*a*) in notches, (*b*) injected with the Cornell tool. All treatments except 2 (*b*) were effective, but (2) (*a*) considerably less so in

autumn. No cost comparisons were made, but (1) (*a*) is considered the speediest and cheapest. [Cf. *F.A.* 16 No. 1727.]

2850. MIGNERY, A. L. **What gives with girdling?** *Sth. Lumberm.* 193 (2417—Christmas No.), 1956 (214–5).

Of 14 methods of hardwood killing tested on ca. 12 species, mostly Oaks, on Texan trial plots, power girdling showed 35% crown kill 1 or 2 years after treatment, double frilling 68%, single frilling 44%, Ammate in 'cups' 78%, and basal sprays of 2,4,5-T in oil (used chiefly against Oaks < 6 in. d.b.h.) 95%. With non-chemical methods more than half of the stems sprouted, but not so as to endanger advanced Pine reproduction, and less if treated between March and June than at other seasons. Most chemical treatments prevented sprouting completely or nearly so. On the average about one-half of each acre was freed from overhead competition.

245. Tending of Trees, Pruning etc.

See also Nos. 2610, 3084, 3196.

2851. SLABAUGH, P. E. **Do pruned Red Pine trees remain dominant?** *Tech. Note Lake St. For. Exp. Sta.* No. 476, 1957. pp. 2.

In 1950, 105 *Pinus resinosa* trees, dominants or co-dominants averaging 16 ft., were pruned to 30, 50, 70 or 90% of their total height; 24 trees were left as controls. After 5 growing seasons, trees pruned > 70% are about to be suppressed by adjacent unpruned trees; most of the trees pruned to 50% are likely to remain dominant. The controls have also remained dominant.

2852. MEIDEN, H. A. VAN DER. Snoei van populier, gebaseerd op kwaliteitseisen van de houtindustrie. **[Pruning Poplars to fulfil the quality requirements of the wood industries.]** *Ned. Boschb.-Tijdschr.* 29 (1), 1957 (1–7). [Du.e.]

The requirements of different industries as regards dimensions and knot-free timber are discussed, and diagrams presented showing the part of a regularly pruned stem containing knots, for 3 site classes and rotations of 25 and 30 years. The following conclusions are drawn: (1) For the veneer and match industries, pruning up to 6 and not above 8 m. is desirable for a normal rotation of 25–30 years. (2) For the clog industry, trees should be pruned to 5–6 m., but living branches would be preferred to knots midway between pith and bark. (3) The box industry can use unpruned large thinnings and the unpruned part of veneer logs. (4) The paper industry prefers unpruned material, because pruned stems always contain some bark round the knots. Pruning should be started early, e.g. at the 4th year and repeated perhaps every 2nd or 3rd year up to the age of 12–15 years in a rotation of 25–30 years. Climbing irons damage the wood and should not be used.

2853. DOOLITTLE, W. T. **Pruning Sycamore.** *Sth. Lumberm.* 193 (2417—Christmas No.), 1956 (222–4).

In a 9-year-old open stand of *Platanus occidentalis* in N. Carolina (mean d.b.h. 6·8 in., mean height 47 ft.) some trees were first pruned to 12 ft. and 3 years later to 18 ft., others first to 18, then to 26 ft. Pruning wounds healed after 1–2 years, initial sapwood decay present where dead branches had been cut off was arrested, and epicormic branching soon ceased. Two years after the first pruning, diameter growth was slightly less and height growth slightly more than on controls, but these differences had disappeared after 5 years.

2854. BRENDER, E. V. **Loblolly Pine not suited for bud pruning.** *J. For.* 55 (3), 1957 (214–5).

Pruning the lateral buds from the terminal cluster for 4 successive years on an old-field stand of Loblolly Pines, beginning at 5 years old, caused vigorous epicormic branch growth, loss in diameter and height growth, and a tendency to poor form and to tipmoth damage to the terminal buds.

2855. **Pruning.** *Rep. For. Timb. Bur. Aust. 1955*, 1956 (29).

Measurement of some 240 knots in veneers from (*a*) saw-pruned, (*b*) secateur-pruned, (*c*) axe-pruned trees, showed that stubs on (*c*) occluded appreciably faster than those on (*a*) or (*b*).

25. Treatment of Defective, Derelict or Very Open Stands

See also No. 3226.

2856. MERCER, T. A. **Replanting a Herefordshire wood.** *Quart. J. For.* 51 (1), 1957 (28–37).

The wood in question consisted of 22 acres of overgrown Alder and Sycamore-Maple coppice with some good Ash and Oak and miscellaneous hardwoods. It was clear-felled and replanted with conifers and a few hardwoods. Notes are given on clearing of the felling site and attempts to kill hardwood stools by poisoning.

2857. DAY, M. W. **A study of Alder on forest lands in Michigan.** *Quart. Bull. Mich. agric. Exp. Sta.* 39 (2), 1956 (301–6). 4 refs.

A study was made on the Dunbar Forest Experiment Station, Mich., of Alder growing on poorly drained soils. Five ¼-acre sample plots were established in 1933; on 3 plots the Alder was clear-felled, on 1 plot 50% of the Alder clumps were girdled, and one plot was left as a control. Species left standing on the treated plots were Balsam Fir, Aspen, Balsam Poplar, and White Spruce. After 20 years the areas were re-stocked with a vigorous sprout growth of Alder. Numerous Balsam Fir seedlings appeared after the clear-felling treatment but few survived > 5 years. There was no change in the stand composition after girdling. All openings in the Alder stands were occupied by grasses which prevented the regeneration of any desirable species. An adjoining stand of mature Balsam Poplar was clear-felled together with the Alder understorey. Regeneration of Poplar was well established after 10 years, probably because of the larger number and better distribution of the Poplar and the lower vigour of the Alder. Invasion of Alder by seed on cleared sites was not serious. Studies of the ecology of Alder in the U.S.A. are briefly discussed.

2858. KRISHNASWAMY, V. S. **Regeneration of dry fuel forests of Madras State.** *Indian For.* 83 (1), 1957 (3–11 + 1 dgm.).

The *panchayat* fuel forests of Madras have been handed back to the Forest Department in a devastated condition. An account is given of several methods of regeneration tried unsuccessfully, and the methods (with costs) proposed for the future. The essential condition of successful regeneration is adequate soil working. A system of discontinuous, staggered trenches and mounds, with a mixture of direct sowing and planting is proposed where complete soil cultivation is not practicable.

26. Combinations of Forestry with Agriculture and Pastoral Husbandry. Irrigated and Floodland Forests, Shelterbelts etc., and their Treatment

261. Alternate Forestry and Agriculture, Periodic or Temporary Agricultural Use of Forest Land

2859. BARTLETT, H. H. **Fire, primitive agriculture and grazing in the tropics.** *Repr.* from *Man's role in changing the face of the earth*, University of Chicago Press. 1956. pp. 692–720. 146 refs.

A summary review of the subject, with references to the literature. [Cf. *F.A.* 17 No. 2927.]

2860. TONDEUR, G.; BERGEROO-CAMPAGNE, B. L'agriculture nomade. Volume I. Congo belge; Côte d'Ivoire. **[Shifting cultivation. Vol. I. The Belgian Congo and the Ivory Coast.]** *FAO For. Developm. Pap.* No. 9, 1956. pp. 230 + 1 map. 12 refs. [F.]

Separate studies of the two countries, in each case giving descriptions of the shifting cultivation practised, factors responsible for its practice, and the possibility of converting its practitioners to modern methods of agriculture. The section on the Ivory Coast also covers the ill effects, and attempts at control or suppression, both now and in the past.

262. Fuel and Fodder Forests

See also Nos. 2858, 3591.

2861. RAO, D. A. R. **Tree culture in lands outside forests [in Mysore].** *Proc. 8th silv. Conf., Dehra Dun 1951*, Part 2, 1956 (193–6).

Notes on growing fuelwood and shade trees, and the practice of farm forestry.

2862. JEYADEV, T. **The problems of large scale Casuarina planting.** *Proc. 8th silv. Conf., Dehra Dun 1951* Part 2, 1956 (111–5).

Describes choice of site, nursery practice, planting, tending, rotations etc. in growing *Casuarina equisetifolia* on a large scale for fuel. Watering accounts for nearly 70% of the cost of establishing such plantations; it is normally necessary only during the first year, and good supervision is essential to ensure that it is done properly and without waste.

2863. DAS, B. L. **Casuarina plantation at Balukhand in Puri Division.** *Indian For.* 83 (1), 1957 (34–40).

An account of the history, revenue, and present condition of these fuel plantations (some 3800 acres) on coastal sands. *Casuarina equisetifolia* is the main species, and attempts to introduce other species inside the plantations have not been successful.

263. Irrigated Forests. Forests subjected to Flooding or Seepage (*Auewald*)

See No. 3156.

264. Farm Forests

See Nos. 2861, 3595.

265. Strips or Lines at Road, Rail and Canal Sides etc.; Hedgerow Trees

2864. BLECH. Möglichkeiten des Pappelanbaus an Wasserstrassen. **[Poplar planting possibilities along water-courses.]** *Holz-Zbl.* 83 (14), 1957 (153–4). [G.]

A general article by an engineer, containing as an appendix the 'Directions on Poplar planting on Federal water-courses (1955)' issued by the W. German Ministry of Transport. These give official guidance on questions of site, protection of banks, flood-water flow, protection from wind etc., and also discuss disadvantages.

266. Shelterbelts, Windbreaks

See also Nos. 2445, 2789.

2865. HOME, SIR J. M. **Shelter woods or belts.** *Advisory Leaflet, Department of Agriculture for Scotland (n.s.)* No. 5, 1956. pp. 7. Price 1*s.*

Notes on advantages of shelterbelts, selection of land and of species, planting stock, draining, planting methods, maintenance and tending.

2866. PAVARI, A. Frangiventi, **[Shelterbelts.]** Ramo Editoriale degli Agricoltori. Rome. 1956. pp. 138 + 17 plates. 44 refs. [It.] Price *Lire* 1000 [14*s.* 6*d.*]

A semi-popular manual in 4 parts: (1) fundamentals, (2) planting and tending, (3) yield and utilization, (4) legislation, legal questions, state subsidies etc., all with reference to Italian conditions.

2867. BARNARD, E. Erfahrungen bei der Anlage von Schutzpflanzungen gegen Wind- und Wassererosionen in Westfalen-Lippe. **[Practical experiences with windbreaks in Westphalia-Lippe.]** *Forsch. u. Berat. (Forstw.) Landesaussch. landw. Forsch. Landes Nordrhein-Westfalen* No. 2, 1956 (153–6). [G.]

To overcome farmers' opposition to waste of land by shelterbelts, narrow belts consisting of 2 or 3 closely spaced rows of 2- to 3-year-old transplants, 65–100 cm. high with occasional higher saplings, of various species in mixture, are recommended. Tending, manuring, fencing etc. are discussed. Where only sheep have access, a special repellent, sprayed 4 times a year at low cost, proved effective.

2868. WILSE, E. Veivesenets og Norges Statsbaners plantninger av snøskjermer (lebelter) på høyfjellsovergangene. **[Planting of snowbreaks (shelterbelts) by the Norwegian State Railways and the Road Board on mountain passes.]** *Norsk Skogbr.* 3 (4), 1957 (99–100). [Nor.]

A brief account of planting since 1952. Species used include *Pinus contorta*, *Larix sibirica*, *Picea asperata*, *P. glauca*, *P. engelmannii*, *Tsuga mertensiana* and *Abies lasiocarpa*, of selected provenances. [Cf. *F.A.* 13 Nos. 3007–8.]

2869. HIRATA, T. **[Fundamental studies on the formation of cutting series. I. On the protection of a stand against storm damage. II. On the centre pressure and drag coefficient of a tree, as affecting shelterbelts.]** *Bull. Tokyo Univ. For.* No. 39, 1951 (1–11); No. 45, 1953 (67–87). 24 refs. [Jap.jap.e.*e.*]

(I) A theoretical discussion of the wind mechanics of single trees. (II) Gives results from wind-tunnel experiments on 3 models of crowns (conical wire frames stuffed with leaves of *Cryptomeria japonica*) and 3 seedlings (ca. 75 cm. high) of *Picea glehnii* and *Thuja orientalis*: (1) for model crowns the coefficient of centre pressure is at $\frac{1}{3}$ of their length, measuring upwards, for seedlings at $[1 + b(a + b)]$ [a and b being the lengths respectively of the lower and upper part of the crown, measured from the level of greatest width]. Little difference was found between the observed mean values and the calculated figures, assuming the drag coefficient to be 1 for the stem and crown, the wind to have a laminar structure, and the bodies to be rigid. (2) At maximum velocities (ca. 30 m./sec.) the models and seedlings behaved similarly, as far as stem breakage and blow-down are concerned, for clear-length/total-height ratios from 0 to $\frac{1}{2}$; for higher ratios the seedlings are more liable to stem breakage than models, while results for blow-down are inconclusive. Some recommendations for shelterbelt structure are made from these findings.

268. Pastured Forests. Grazing on Forest and Open Ranges. Forage Plants etc.

See also No. 2859.

2870. ROLLEY, J. Rapport au Gouvernement de l'Iran sur le problème du pâturage en forêt. **[Report to the Government of Iran on the problem of grazing in the forest.]** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 579, 1957. pp. 53. [F.]

2871. HALLS, L. K., KNOX, F. E., and LAZAR, V. A. **Common browse plants of the Georgia coastal plain, their chemical composition and contribution to cattle diet.** *Sta. Pap. Stheast. For. Exp. Sta.* No. 75, 1957. pp. 18. 14 refs.

Analyses 14 species, including some hardwood trees, e.g. *Acer rubrum*, *Nyssa sylvatica* and *Quercus stellata*.

2872. BELL, A. T., *et al.* ***Acacia georginae* poisoning of cattle and sheep.** *Australian Veterinary Journal, Sydney* 31 (10), 1955 (249–57). 1 ref. W.A.H.

Field and laboratory tests have established that the pods and seeds, and the leaves of root suckers (but not, as a rule, other leaves) of *A. georginae* are toxic, and are presumably the cause of frequent livestock poisonings in the Georgina river basin, the area of Queensland in which it occurs.

27. Arboreta. Arboriculture for Ornamental Purposes. Hedges and Hedge Plants

See also No. 2861.

2873. GILBERT, H. W. **Large trees for Indiana.** *Amer. Nurserym.* 105 (2), 1957 (8, 57 . . . 61).

Discusses criteria governing selection and lists 28 deciduous trees with data on 'texture', shape, crown spread and height, suitable for parks, public grounds and street plantings.

2874. SAYLES, E. V. **Power line design for compatibility with trees.** *Trees Mag., Ohio* 17 (1), 1957 (6, 14–6).

A paper read at the 1st Street Tree and Utility Conference held at Cleveland, March 1955. Covers such subjects as payment for services, long-term planning, character of overhead circuits, clearance between trees and wires, effect of pole height on cost of construction, and fixed pole locations and span lengths.

2875. WOODLAND, F. **Co-ordination of telephone lines with street trees.** *Trees, Ohio* 17 (2), 1957 (11–5).

28. Husbandry of Forest Products Other than Wood

See also section 892.

281. Christmas Trees

See Nos. 2495, 2845.

282. Bark Crops

2876. NAIR, K. N. R. **Tan bark Wattles: their importance and cultivation in South India.** *Proc. 8th silv. Conf., Dehra Dun 1951*, Part 2, 1956 (57–69).

A fairly detailed account of silvicultural technique, rate of growth, rotation, protection, utilization, and future prospects, for *Acacia decurrens* and *A. decurrens* var. *mollissima* in S. India.

283. Fruit and Seed Crops etc.

2877. KRUMMSDORF, A., Forstliche Produktion und Obsterzeugung. **[Forestry and fruit growing.]** *Forst u. Jagd* 4 (11), 1954 (417–8). 6 refs. [G.]

Discusses the possibilities (and limitations) of growing fruit-bearing trees and shrubs, particularly nuts, in the forest, on the forest border, along roads, in shelterbelts, etc.

284. Crops Tapped for Exudations

See also Nos. 2476, 2669, 2834, 3232.

2878. PAŠIŠKJAVIČUS, I. I. Karrorazmetčik. **[The tapping face marker.]** *Gidrol. lesohim. Prom.* 9 (1), 1956 (23). [Russ.] P.R.

Illustrated description of a gauge, made from steel and wood, which scribes the proper width and angle of the tapping face.

2879. SAIKIA, B. **Rosin and turpentine industry in Assam.** *Proc. 8th silv. Conf., Dehra Dun 1951*, Part 2, 1956 (528–32).

A detailed account, by the Special Officer appointed to the project (1950), of revived experiments in

tapping *Pinus khasya* in the vicinity of Shillong, leading to State sanction for a pilot scheme utilizing > 100,000 trees above 12 in. in diameter and an Indian-made distillation unit. Analysis of the resin (tabulated) shows it to be of high quality. The economics of the scheme, which compare favourably with the established industries in Uttar Pradesh, are given in detail. Twelve months' continuous single-channel tapping showed highest yields for a 4- to 5-day freshening cycle and the 8 months Sept. to April, i.e. outside the heavy monsoon period—the reverse of tapping seasons in U.P. and Punjab. Yields averaged ca. 5 lb. per channel. The plentiful bamboo, not clay, pots, are being used for receptacles. [Cf. *F.A.* 13 No. 2638.]

2880. CRIVELLARI, D. Primi risultati di un ottennio di esperimenti sulla resinazione del pino d'Aleppo. **[First results from 8 years' experiments on resin-tapping of *Pinus halepensis*.]** *Ital. for. mont.* 11 (6), 1956 (245–68 + 13 photos). 10 refs. [It.f.]

Presents and discusses full data on the author's experiments, designed to determine yields obtainable by the commonly used methods of tapping, and the effects of tapping on vigour, increment, and seed production of the trees. Of the methods tested—(1) French face, (2) German face—both operated by either (*a*) continuous tapping or (*b*) tapping to death, (1) gave consistently better yields. For trees of diameter ⩽ 30–35 cm., mean annual yield for (1) (*a*) was 3·3 kg. and for 1 (*b*) 6·5 kg. per tree. The rest period of 1–2 years, usually given every 4–5 years, may be postponed to every 6 years without injury to the tree. Monthly yields are closely correlated with climatic factors and usually reach a maximum in July. The most economic minimum diameter at which tapping should begin is between 24 and 27 cm. o.b., considerably more than the 20 cm. of current practice. The face should be worked upwards in both methods. After continuous tapping for 8–10 years, cone production was reduced by 20·66% and seed production by 27·49%; germinative capacity was also reduced, probably because of an increase in the number of empty seeds. These reductions are, however, not such as to reduce significantly the probability of natural regeneration of stands. Both (1) and (2) considerably reduced volume increment, but since the wood of *P. halepensis* is of poor quality and used chiefly for mine timbers and fuel, this reduction is compensated for by the revenue derived from the resin.

2881. CIMA, I. S. O podsočke kedra sibirskogo. **[The tapping of *Pinus sibirica*.]** *Gidrol. lesohim. Prom.* 9 (8), 1956 (25). [Russ.] P.R.

P. sibirica is tapped in the U.S.S.R. only in one area (near Tomsk), with a humid climate (precipitation 500–600 mm.). The stands are mostly 60% *P. sibirica*, 30% *Abies sibirica* and 10% *Betula* sp., age 120–240 years, site quality III, density 0·6–0·8, mean d.b.h. 34–52 cm. After 3 years of tapping the trees are given 1 year of rest. The tapping season is planned for 100 working days. Up to 1954, only downward freshening was done; since then it has been followed only during the first 2 years and upward freshening thereafter. A 10- to 15-cm. space is left between faces. The central gutter is up to 15 mm. broad and up to 7 mm. deep; depth of freshening ⩾ 5 mm., spacing between freshenings ⩾ 10 mm., breadth of face ⩾ 24 cm., freshening cycle 7–10 days. The resin has an oily consistency, and the appearance of fresh honey. Trees on S. slopes give a higher resin yield. Highest resin flow occurs in July and August. The yield per face usually exceeds 300 g./season.

2882. ORLOV, I. I. Osobosmoloproduktivnaja sosna. **[A Scots Pine tree with an exceptionally high resin yield.]** *Gidrol. lesohim Prom.* 9 (4), 1956 (14). [Russ.] P.R.

A Scots Pine in Sverdlovsk province (aged 140–160 years), height ca. 28 m., d.b.h. 48 cm., first live branches at 12–15 m. up the bole, on level ground with loamy sand, the tree being on the edge of a stand) had a mean annual resin yield from 1951 to 1955 of just over 7 kg., compared with a regional mean of 0·65 kg.

2883. HUEBNER, E. Steigerung der Harzerträge; die intensive Harznutzung. **[Increasing resin yields; intensive resin tapping.]** *Forst u. Jagd* 5 (3; 6), 1955 (121–3; 258–62). [G.]

Discusses, with experimental data from E. Germany ; (*a*) types of faces and tools, and spacing and progression of streaks, coming out strongly in favour of downward freshening; (*b*) an intensive tapping system for stands due to be cut within 3 years but not yet, or not yet fully, worked for resin. This involves faces nearly, or even completely encircling the stem, freshening at shorter intervals with more widely spaced streaks, and the alternate freshening of 2 faces one above the other, separated by interspaces of varying widths.

2884. ILJJUHOV, I. K. Iz opyta raboty vzdymščika. **[From the experience of a resin tapper.]** *Gidrol. lesohim. Prom.* 9 (2), 1956 (20). [Russ.] P.R.

Notes by the author, an actual tapper, on his personal practice and experience in E. Siberia. At the end of the tapping season, he immediately shaves off all but a 2- to 3-mm. layer of bark on the site of the next year's face. As the stands under tapping are overmature and deteriorating, with sapwood often a mere 4–5 mm. thick, he freshens to a depth of 3–4 mm. instead of the regulation 6–7, thereby increasing the resin yield by 15–20%. Further, since the root system thaws very slowly in E. Siberia, he freshens upwards in May–June and later downwards, increasing the yield thereby by 20–25%. He asserts that forests in direct sunlight yield 15–20% more than those permanently in shade. The tapping cycle should be adhered to exactly, whatever the weather, the best time being early morning or evening.

2885. SINELOBOV, M. A., *et al.* Novyĭ metod podsočki s himvozdeĭstviem. **[A new method of tapping [Pine] with the use of chemicals.]** *Gidrol. lesohim. Prom.* 9 (1), 1956 (15–7). 3 refs. [Russ.] P.R.

The authors found that the period of resin flow after wounding can be substantially extended if H_2SO_4 is made to act on the resin tissues for at least 1 month; resin secretion stops as soon as the acid

ceases to penetrate the zone of unopened ducts. The resin yield per freshening depends not only on the amount of acid applied but also on the extent to which it is retained on the freshened part and on the proportion that penetrates along the cambium. In 1954 the authors tested two methods of facilitating the gradual penetration of the acid. (1) By means of a special tool (illustrated and described) horizontal cuts were made, 20 cm. long and 0·2–0·4 cm. deep into the wood and downwards into the stem so as to retain the liquid acid. (2) In similar cuts, both horizontal and inclined at 10° from it, the acid was applied as a paste by mixing it with silica gel, zeolite, kaolin or bentonite. After preliminary trials in 1954, the main experiments with method (1) were conducted in 1955 on > 500 trees. With 1 c.c. of 96% H_2SO_4 per freshening, the resin yield increased as the freshening interval increased; the highest figure (9·3–9·7 times the control value) was obtained for a 30-day interval, with downward freshenings. During the 30-day period, the relative figures of yield were 65, 23 and 12% for the first, second and third 10-day periods; ca. 5–10% of the total yield remained in the inner bark tissues. With (2) (the paste containing concentrated (96%) H_2SO_4 with 15 or 20% of silica gel), it was found that during the first two or three collections (at 10-day intervals), this method gave a far greater yield than (1), but later the position was reversed. [Cf. *F.A.* 17 No. 2824.]

2886. KAMELIN, V. P. Podsočka novymi metodami. **[Tapping by new methods.]** *Gidrol. lesohim. Prom.* 9 (7), 1956 (22–4). [Russ.] P.R.

Describes results obtained in 1956 (up to 1st July) on (*a*) 700,000 faces [of Scots Pine] with chlorinated lime as stimulant, and (*b*) 405,000 faces, using a paste of concentrated H_2SO_4 and kaolin. Some details of preparing the paste are given. Both chemicals greatly raised the yield per freshening, ca. 2·5 times with (*a*) and 4·5 times with (*b*). Losses of resin and cost of labour were much less when the angle between the streaks was reduced from the regulation 120–150° to 70–90°.

2887. KAMELIN, V. P. Dopolniteljnyĭ istočnik syrjja dlja kanifoli. **[Supplementary source of raw material for rosin.]** *Gidrol. lesohim. Prom.* 9 (2), 1956 (14). [Russ.] P.R.

Shavings 1–3 mm. thick, removed from [Pine?] faces 1 year before felling, using a narrow freshening tool, were found to contain 44·6% resin substances. This procedure is said to be more economic than collection of scrape.

2888. BHARGAVA, O. M. **The management of *Sterculia urens* (Karey) and *Boswellia serrata* (*Salai*) for gum and gum oleoresin.** *Proc. 8th silv. Conf., Dehra Dun 1951* Part 2, 1956 (511–28). 6 refs.

A detailed account of the distribution and habitat, phenology and silvicultural characteristics of these widespread tree species; the histology and development of their gum and resin ducts (illustrated); the various systems of commercial tapping, their costs and returns, with an outline of improved tapping rules and drawings of tools; main uses of the products; trade statistics; silviculture; and problems for research.

2889. TROSJKO, I. K., and DANILIK, V. N. Dobyča lohovoĭ kamedi metodom podsočki. **[Collection of the gum of *Elaeagnus* [*angustifolia*?] by tapping.]** *Gidrol. lesohim. Prom.* 9 (4), 1956 (26–7). [Russ.] P.R.

Elaeagnus gum, a valuable raw material in the textile industry, is secreted by wounded trees. The author recommends tapping 2–3 years before felling. Several thousand ha. of forest land in Central Asia have pure *Elaeagnus* stands, while mixed stands cover ca. 100,000 ha. Results are given of trial tappings made in 1954. The Timofeev-type tapping tool is recommended, the cuts being longitudinal and penetrating into the wood; the best tapping period in Uzbekistan is from 1st May to 1st Aug., with 4–5 freshenings; this gave a mean gum yield of 20 g./tree/season. In 1955, the freshenings were made every month from 1st May to 1st Sept., the previous wounds being renewed at each new freshening; the spacing was 3 cm., and freshenings were made upwards. This procedure gave yields of ca. 40–80 g. per tree. The highest yield was obtained from trees 22–23 years old.

286. Osier-Growing

2890. KEARNEY, J. C. **Willow growing and utilization in the Suir valley.** *Irish For.* 13 (2), 1956 (73–7). 5 refs.

2891. GÜNTHER, H. Die Kulturweidensorten und Erfahrungen über ihre Anbaumöglichkeiten in der Forstwirtschaft. **[Cultivated Willow varieties and their forestry possibilities.]** *Forst u. Jagd* 5 (10; 11), 1955 (406–11; 445–50). 11 refs. [G.]

A classification of the chief commercial varieties, their distinctive characters, performance, requirements, cultivation, hardiness and uses, with particu- reference to spoil mounds [cf. *F.A.* 15 No. 3537], where *Salix acutifolia* was very promising.

2892. STRYCKERS, J. Het natriumzout van 2,2-dichloropropionzuur als herbicide voor enkele gewassen. **[The Na salt of 2,2-dichloropropionic acid as a herbicide for some crops.]** *Repr.* from *Mededelingen van de Landbouwhogeschool en de Opzoekingsstations van de Staat te Gent* 21, 1956 (595–615). 13 refs. [Du.f.g.e.*e.*] A.P.B.

This chemical (dalapon) had a favourable influence on the growth of Osier Willows when applied to the stocks, as had also TCA. It should not, however, be applied once the buds have started to swell. *From author's summary.*

288. Crops Grown for Animal Products

2893. ZWÖLFER, W. Die Waldbienenweide und ihre Nutzung als forstentomologisches Problem. **[Bee pasture in the forest seen as a problem of forest entomology.]** *Verhandlungen der deutschen Gesellschaft für angewandte Entomologie E.V., Frankfurt a.M. 1952*, 1954 (164–8). [G.] I.I.E.

Mentions frequently untapped resources of nectar and honeydew as bee pastures, estimates possible

yields which might offset increment losses due to even non-injurious aphids and coccids, and briefly outlines the aims of the research station on forest beekeeping attached to the Institute of Applied Zoology, Munich.

2894. ZOEBELEIN, G. Versuche zur Feststellung des Honigtauertrages von Fichtenbeständen mit Hilfe von Waldameisen. [**Ascertaining the honeydew yield of Spruce stands by experiments with wood ants.**] *Z. angew. Ent.* 36 (3), 1954 (358–62). 13 refs. [G.] O.H.

By counting ants frequenting *Physokermes piceae* on Spruce and ascertaining the weight of the honeydew collected, total yield per ha. of Spruce stand is estimated at 700 kg., and great increases in exploitation as bee pasture are considered possible. Some data on the honeydew collection by ants from lachnids on Spruce, Beech and Pine are also given. [Cf. *F.A.* 18 No. 3085.]

3. WORK SCIENCE (WORK STUDIES). HARVESTING OF WOOD: LOGGING AND TRANSPORT. FOREST ENGINEERING

30. Work Science (Work Studies): General

302. Man and Work (Physiology and Psychology)

2895. FUJIBAYASHI, M., TSUJI, T., and WATANABE, S. [**Contributions to the labour employed in various forest operations.**] *Bull. For. Exp. Sta. Meguro, Tokyo* No. 86, 1956. pp. 182. 17 refs. [Jap.e.]

A comprehensive investigation into the relative metabolic rate (R.M.R.) in a wide range of operations from seed collection to sawing, supported by regressions and illustrated with drawings of tools used (including power saws), photographs, graphs and tables.

2896. HILF, H. H. Die Lebensleistung des Forstarbeiters. [**The working life of the forest worker.**] *Forstarchiv* 27 (5; 6), 1956 (101–4; 125–34). 27 refs. [G.g.]

Presents the results of a survey on German forest workers ⩾ 50 years old. A comparison of age distribution is made with (*a*) workers in other industries, (*b*) forest workers in other countries. Data are given on incidence of illness and the death rate. Recommendations are made for the mechanization of heavy work wherever possible and for measures for improved care of health.

2897. IRMISCHER, F. Untersuchungen über die körperliche Beanspruchung im Holzeinschlag, insbesondere bei der Einmannarbeit. [**Physical strain of logging work, particularly one-man work.**] *Abstr. of thesis*, in *Forsch. u. Berat. (Forstw.) Landesaussch. landw. Forsch. Landes Nordrhein-Westfalen* No. 2, 1956 (58–60). [G.]

[Cf. *F.A.* 17 No. 2852.] One-man manual work saved 4–24% time in felling young Beech and Spruce stands (volume of wood > 7 cm. diam. averaging < 0·20 cu.m.) but effort per minute was 4–10% greater. Swedish bowsaws with 915 × 25 mm. blades proved most suitable for diameters ⩽ 20 cm.

304. Hygiene. Safety. Accidents and their Prevention

See also Nos. 2743, 2921–2.

2898. GILBERT, I. H. **Evaluation of repellents against mosquitoes and deer flies in Oregon.** *J. econ. Ent.* 50 (1), 1957 (46–8). 3 refs.

Tabulates data on repelling and protection time for 12 skin and 25 clothes preparations. On the skin, diethyltoluamide was twice as repellent as the standard M-2020 against mosquitos, and all 12 new preparations outlasted the standard. Against the deer fly (*Chrysops discalis*) none differed markedly in repellency from the standard. Of the clothes repellents, 22 maintained almost complete protection at the 26th day.

307. Tools, Equipment, Machines and Working Animals: General

See also Nos. 2730–2, 2763, 2765, 2800–3, 2878, 2936, 2949–51, 2969, 2975–6.

2899. **Machines and equipment.** *Wood* 22 (1), 1957 (28–9).

Gives brief descriptions of new equipment available in the U.K., including a 48-in. band resaw (Stenners of Tiverton Ltd.) and a logging arch (Prailles (Hereford) Ltd.).

2900. **Machines and equipment.** *Wood* 22 (3), 1957 (108–9).

Includes the 'Horn-draulic' hole-borer driven by the power take-off of standard tractors. It is capable of plumbing, boring, and lifting from a hole 6 ft. 6 in. × 1 ft. 6 in. in 30 min. An auger of 2 ft. diam. can be supplied. (Steel Fabricators (Cardiff), Ltd.) The Shaw V.H.F. moisture meter (J. L. Shaw (Bradford) Ltd.) is also dealt with.

2901. GRÜNEKLEE, H.-G. Die Unirag-Universal-Dieselraupe. [**The Unirag universal diesel crawler tractor.**] *Forst- u. Holzw.* 12 (5), 1957 (82–5). 4 refs. [G.]

An illustrated description of a small German tractor (width between track centres 580–625 mm., total weight 800 kg., 12-h.p. diesel engine, 800–1000 kg. tractive power), its accessories and uses. Hydraulic winches and logging tongs, ploughs, rotary cultivators, road-building equipment (angle-dozer, buckets) and sprayers are described.

31. Logging and Transport: General

See also No. 2670.

2902. [**On facilitating logging and timber transport from not easily accessible stands.**] *Sborn. čsl. Akad. zeměd. (Lesn.)* 29 (10), 1956 (693–744). [Cz. Russ., E., or G.]

The following papers, read at a conference

(Brno, March 1956) are presented: (1) Investigation of conditions for logging and timber transport in areas not easily accessible, determination of the principal trends in, and criteria for choice of, logging methods, including the organization of lines of transport (*V. Štaud*) [Cz.]; (2) Paper on the same subject (*G. Artner*) [Cz.]; (3) Development and operation of new types of high-level cableways and winches (*I. Adámek*) [Cz.], and (4) Mechanization of transport in forestry from the economic standpoint (*R. Stolařík*) [Cz.]. The papers are preceded by an introductory article (*K. Matyáš*) [Cz.Russ.E.]. The resolutions passed at the conference and proposals for a technical solution of the transport problem are also given [Cz.Russ.E.G.].

32. Felling and Related Operations

322. Felling Season. Preparatory Measures

See also No. 2909.

2903. TUOVINEN, A. Kuorellisten mäntytukkien pilaantumisesta. [**The deterioration of unbarked Pine logs.**] *Julk., Metsäteho, Helsinki* No. 34, 1956. pp. 48. 12 refs. [Fi.e.e.]

In an investigation of deterioration in unbarked logs, both winter-felled (w.f.) and summer-felled (s.f.) (i.e. felled in autumn and left to season with tops intact), bundles comprising 912 s.f. and 1134 w.f. logs were removed from water storage in December, and the logs sawn up and classified by degree of deterioration. In further experiments, logs (2081 s.f., 962 w.f. and 431 barked mainly in winter) were launched singly in May or June, bundled in July, and sawn and examined in September. Results showed that summer felling causes considerable deterioration from rot and bluestain, especially in butt logs. Deterioration in w.f. logs is less. Logs in the upper part of the bundle show heavy deterioration regardless of the method of felling. Deterioration decreases with increasing diameter, the effect being especially noticeable in the upper part of the bundle; the main reasons probably are that the thicker bark associated with larger diameter is less liable to be knocked off, and that the barkbeetles carrying bluestain fungi usually nest under thin bark. In s.f. logs, deterioration decreases with increasing amount of heartwood. Early launching reduces deterioration. Good ventilation during spring storage in s.f. logs increases and in w.f. butt logs decreases deterioration. S.f. butt logs suffer more than w.f. ones from damage from slashes during felling and from cracks in the bark. PCP treatment of butt and top ends decreased deterioration from the ends of s.f. logs but had no effect on w.f. ones. *From author's summary.*

2904. H., H. W. **Paul Bunyan chemistry. Researchers are trying to find out what makes chemical debarking work.** *Industr. Engng. Chem.* 48 (12), 1956 (17*A*). P.R.

A research group at Syracuse, N.Y., have found a few organic arsenicals (of the type of monoethanolamine arsenite) that may be more effective than Na arsenite. Because of their odour and lack of 'saltiness', they might be less attractive to wildlife. Field trials have not yet been staged.

2905. REINES, M. **Tissue differentiation and the application of sodium arsenite to girdled trees relative to bark peeling.** *For. Sci.* 2 (4), 1956 (297–304). 11 refs.

Gives the beginning and end of xylem and phloem growth and of bark slip for two seasons in untreated trees (two species of *Quercus* and one each of *Carya, Acer, Fraxinus* and *Prunus*); the concentration of As at different levels and periods after application; and the amounts in the top leaves and twigs. 'Sap peeling' is actually independent of sap flow, the separation of bark and wood (bark slipping) taking place in the weak zone of undifferentiated xylem near the cambium. The As moves up in this zone (spirally in spiral-grained trees) rapidly killing local tissues, the subsequent shrinking, swelling, and damage of which causes the separation of the bark (which in the Cherry is delayed by the ray structure). Girdling deeper into the wood generally reduces the effectiveness of the poisoning.

2906. THOMPSON, W. S. **Chemical debarking of Southern trees.** *J. For.* 55 (1), 1957 (33–4).

An investigation was carried out in Mississippi in 1954 and 1955 to determine the practicability of chemical barking in the Southern U.S.A. A 40% aqueous solution of Na arsenite was applied during March, May, June and August to girdles on Red Oak, White Oak, Hickory, Sweetgum, Shortleaf Pine and Loblolly Pine. A rapid kill and development of favourable peeling conditions took place in all species except Hickory. Moisture content of the poisoned trees was reduced to ca. 45% within 4 months of the March, May or June treatments and to ca. 60% within 4 months of the August treatment. Insect and fungal attack caused serious damage, regardless of time of treatment, greatly reducing the merchantability of all species. Trees girdled and poisoned with Na arsenite sprouted more prolifically than those that were girdled only.

2907. MATERNA, J., and NOVÁK, V. Neue Erkenntnisse bei der chemischen Entrindung. [**Recent observations on chemical barking.**] *Forst u. Jagd* 5 (1), 1955 (6–9). [G.]

Reports on further experiments at the Forest Research Institute at Zbraslav-Strnady, Czechoslovakia, confirming and amplifying earlier findings on the effect of chemical barking on beetle attack and the incidental poisoning of neighbouring trees [cf. *F.A.* 15 No. 321; 16 No. 513]. The wood borer *Trypodendron lineatus* attacked poisoned trees but not the controls, and caused some damage, though most of the insects died. Removing the outer bark only, and applying As_2O_5 in NaOH on the phloem, gave results equal to application on the exposed wood. The As leaching into the humus from the needles shed by poisoned trees was sufficient to inhibit germination of Spruce seed and to injure small seedlings.

2908. ZIEGER, E. Probleme der chemischen Entrindung. [**Problems in chemical barking.**] *Forst u. Jagd* 5 (5), 1955 (211–3). 4 refs. [G.]

Briefly summarizes earlier work [cf. *F.A.* 16 No. 3052] and reports on further trials with As, chiefly with other species. With Pine, resin flow was the

chief problem; with Beech, discoloration; with Poplar, incomplete loosening of the phloem. With Birch no effects were observable before the following spring. Tannin content of Spruce bark was only 5–6%, attributed to the destruction of the phloem by the As compound. A powered hand-tool for girdling is briefly described.

323. Felling and Subsequent Primary Conversion

See also Nos. 2913–27.

2909. LE RAY, J. Essais d'abattage mécanique à la scie à un homme. **[Experiments in felling with one-man power saws.]** *Bois For. Trop.* No. 51, 1957 (59–78). [F.e.span.]

Gives a detailed account, with many photographs and diagrams, of experiments carried out jointly by the Centre Technique Forestier Tropical and the Compagnie Française des Bois du Gabon, in which 165 trees of *Aucoumea klaineana*, 70–190 cm. basal diameter, were felled with one-man chain-saws. Special attention was given to preparation of the tree by removing buttresses, and measures to prevent splitting and to control the direction of fall.

326. Sequence of Operations (including Felling Instructions, Primary Conversion after Extraction, Composition of Gangs, One-Man Work etc.)

See No. 2897.

33. Degree of Utilization and Waste. Clearing the Felling Site. Harvesting of Small Wood

See also Nos. 2695–6, 2856, 2970, 2975, 2982, 3508.

2910. HARRIS, H. K. **Mechanized slash disposal.** *E.D. Rep. U.S. For. Serv.* No. 43, 1956. pp. 27.

Reports on a research project under the heads: (1) slash disposal by dozer (machine size, rating an area for dozer work, output and cost, operational technique, effects of bunching on regeneration); (2) slash disposal by chipping (improving the effectivenesss of chipping, costs of operation); (3) felling defective residual stands (steel ball-and-chain method, chain-saw felling).

2911. OLSON, D. S., and FAHNESTOCK, G. R. **Logging slash: a study of the problem in Inland Empire forests.** *Bull. Coll. For. Univ. Idaho* No. 1, 1955. pp. 52. 30 refs.

Reviews progress in the research programme on logging slash and its disposal in Montana, Idaho and parts of Washington. Some projects have been completed and published, others are still in progress.

34. Storage of Wood in the Forest and at Log Dumps ('Landings')

2912. KLEM, G. G. Biltømmer og virkes-behandling. **[Handling wood for road transport.]** *Norsk Skogbr.* 3 (4), 1957 (92, 95). [Nor.]

Makes recommendations on storage and latest date of delivery at the mill for various assortments, barked and unbarked, to ensure the minimum of degrade from fungus and insect attack and from checking.

35. Performance Measurements for Determining Piece Rates in Felling and Related Operations

See also Nos. 2680, 2897, 3233.

2913. FOGH, I. F. **Woods work efficiency and crew organization.** *Pulp Paper Mag. Can.* 57 (13), 1956 (138–40). 1 ref.

A condensed version in English of a publication of the Swedish Forest Research Institute [see *F.A.* 17 No. 473], with comments on the applicability of the results to Canadian conditions.

2914. MAKKONEN, O. Koivurankojen valmistuksen palkkaperusteet. **[The wage basis for the preparation of Birch 'long logs' [i.e. from 2 to 6 m. long].]** *Tied., Metsäteho, Helsinki* No. 122, 1956. pp. 7. [Fi.e.*e.*]

The preparation of logs 2, 4 and 6 m. long or of varying lengths in the range 3–6 m., unbarked, barked in strips or completely barked, was compared. When 4-m. logs were cut, the last bolt of a stem might be cut to the length of 2 m., and with 6-m. logs to 2 or 4 m. The minimum permissible diameter was 5 cm. Tabulated figures show the division of working time, cross-cutting and stacking time per stem, total working time per stem and per cu.m., average length of utilized part of stem and of the part exceeding 7 in. diam. (i.e. that carrying a % wage increase) and the total working time per linear metre. Metsäteho was commissioned to make this study to provide a basis for wages.

36. Tools, Machines and Equipment for Felling and Related Operations

See also Nos. 2735, 2842, 2909–10.

2915. DOUDA, V., and LÚTOČKA, L. Návrh normy dřevorubeckého nářadí a hospodaření s ním v Československu. **[Draft standard for logging tools and their use in Czechoslovakia.]** *Sborn. čsl. Akad. zeměd. (Lesn.)* 29 (6), 1956 (371–84). [Cz.russ.e.g. *russ.g.*]

Mainly a description of specially designed testing instruments (e.g. a dynamometer that measures the speed of an axe at the moment of the blow, and for determining pressure and tension in saws).

2916. SALMINEN, J. Tutkimus Bark-Lasse kuorimakoneesta. **[Report on the Bark-Lasse barking machine.]** *Tied., Metsäteho, Helsinki* No. 120, 1956. pp. 10 + 5 photos. [Fi.e.]

Reports on a 3-day trial of the machine [see *F.A.* 16 No. 1816]. A total of 98 stacked cu.m. of 2- and 4-m. Spruce and 3 stacked cu.m. of 2- to 5-m. fresh, unfrozen, Pine pulpwood logs was barked, using 3- and 4-man crews. Feed speed dropped from 10·5 to 6·3 m./min. as unbarked mean diameter increased from 8 to 17 cm., with a value of 7·9 m./min. at 13·5 cm. diam. At this speed and diameter, production rate was 5·57 unbarked stacked cu.m./hour with a 4-man team and 4-m. logs, and 4·49 cu.m./hour with a 3-man team and 2-m. logs. Fuel consumption was 0·45 litres petrol/unbarked stacked cu.m. Barking costs were estimated to be 7% lower than for barking by hand.

2917. SCHWANEBECK, G. Erneute Prüfung von

Handsägen im Institut für Forsttechnik in Neuroofen. **[Renewed testing of handsaws at the Institute of Forest Technology, Neuroofen.]** *Forst u. Jagd* 4 (9), 1954 (322–6). [G.g.]

Describes and illustrates the tooth patterns of 9 two-man cross-cut saws and 1 bow-saw, and tabulates times taken for cutting 1 cu.m. of Beech, Spruce, or Pine. The Geyer-Sirius saw, which had won a similar test 2 years earlier, was again judged best, taking into account both performance and ease of maintenance.

2918. Kaminsky, G. Motorsägen. **[Power saws.]** *Forstarchiv* 27 (5), 1956 (122–4). [G.]

Twenty-eight different power saws from England, Germany, Norway, Sweden and the U.S.A. are illustrated, and data are tabulated on length, weight, h.p., chain type and speed, and costs.

2919. Provade motorsågor. **[Tests on power saws.]** *Skogen* 44 (5), 1957 (152). [Sw.]

Summarizes reports on tests by Ultuna, the Swedish State machine-testing centre, on the Jo-Bu Junior, Homelite, McCulloch, and Be-Bo one-man power saws. The full reports are available from Ultuna, Uppsala 7.

2920. Bellegarde, R. de. L'emploi de la scie mécanique à un homme pour l'abattage et le tronçonnage des arbres en Suisse. **[The use of one-man power saws for felling and cross-cutting of trees in Switzerland.]** *Rev. int. Bois* 24 (225), 1957 (33–4). [F.]

Gives a short account of the courses of training in the use of these saws, and time studies of their use, made in Switzerland. The economic importance of securing maximum working time is stressed.

2921. Einmannmotorsägen—Lehrgang in Münchehof (Harz.). **[[Instructors'] course for one-man power saws at Münchehof.]** *Holz-Zbl.* 83 (10), 1957 (109). [G.]

Summarizes recommendations on the questions of grants for workers' purchase of such saws, and accident prevention, formulated at this course (organized by Geffa).

2922. Scie mécanique et prévention des accidents. **[Power saws and accident prevention.]** *Forêt, Neuchâtel* 10 (4), 1957 (87–90). [F.]

Practical recommendations on the organization of work in felling and primary conversion, stressing the danger of 'helping' the operator, the danger of engine noise drowning warning noises or signals, giving hints on safe starting and handling, and suggesting the use of a light steel helmet obtainable from the forest office.

2923. Hutson, H. P. W. **Hints on the care and use of axes.** *Quart. J. For.* 51 (1), 1957 (17–27).

Notes on selection, handling, sharpening and repair of axes, illustrated by 22 drawings.

2924. Schwanebeck, G. Prüfung von Schnitz- und Schälböcken. **[Testing barking trestles.]** *Forst u. Jagd* 5 (2), 1955 (83–8). [G.]

Discusses the merits of various constructions of trestles for barking logs and pulpwood, tested at the Institute for Forest Technology, Neuroofen. They include experimental trestles for working in a sitting position.

2925. Livingston, J. W., and O'Neil, L. **Beaver Stump Cutter incorporates new principles.** *Trees Mag., Ohio* 17 (1), 1957 (8).

[Cf. *F.A.* 18 No. 491.] Gives some further account of the working of the machine, with two photographs. The machine is mounted on the frame of a jeep equipped with power take-off. The stump is disintegrated by a cutterhead having > 100 high-carbon-steel teeth and revolving at ca. 1300 rev./min. It is placed on the far side of the stump and lowered automatically to the desired depth of cut. The jeep is then set in forward motion at a speed from 0 to 4 ft./min. The depth of cut can be from a fraction of an inch to 5 in., depending on the density and hardness of the wood; average usually $2\frac{1}{2}$–$3\frac{1}{2}$ in. A freshly cut Elm stump of 36-in. diam. can be cut to 5–6 in. below ground level in 30–45 min. The cut wood comes out in the form of sawdust and is easily shovelled up. The whole machine is very simple, with low maintenance costs. The teeth, which are replaceable in 20–25 min., require 1–2 sharpenings per 8 hours of operation; these can be done on the machine and take only 15–20 min. with a portable grinder. Production is to begin shortly.

2926. Buskupptagare Effektiv. **[The "Effektiv" brush uprooter.]** *Meddelande, Statens Maskinprovningar, Ultuna, Uppsala* No. 1204, 1956. pp. 2. [Sw.] Sil.

Consists of two flat iron bars, fitted together at one end, clasp-knife fashion, one of which has a chain at the free end, the other a hook, through which the chain runs to the draw-bar when the device is laid round a bush or tree. With the help of a tractor, small trees up to 10 cm. basal diam. can be uprooted.

2927. Heyden, D. Stammpressen. **[Stem presses.]** *Forstarchiv* 26 (9), 1955 (216). [G.]

Describes 3 devices for preventing the bole splitting when the saw-cut is being made: the Swiss Simplex [cf. *F.A.* 17 No. 479], the German Erlau, which has a similar clamp to draw the chain tight but needs no wedge, and the Rienhart chain, which is fastened at waist height and knocked down by axe strokes.

37. Transport

372/377. Land Transport

See also Nos. 2899, 2901–2, 3245.

2928. Lünzmann, K. Front- und Schwenklader. **[Front and swivel loaders.]** *Forstarchiv* 27 (8), 1956 (195–6). [G.]

Technical data and capital and operational costs are shown for 12 loaders of German make.

2929. Bossel, H. Forstseitiges Rücken von Stamm- und Schichtholz. **[Skidding logs and cordwood by direct labour.]** *Forstarchiv* 27 (1), 1956 (7–13). 4 refs. [G.]

Discusses the advantages and disadvantages of skidding being carried out by the forest owner. An

account is given of the results and experiences of skidding in the Netze state forest between 1952 and 1955; tables show the volume of logs and cordwood skidded for each year, the wage limits, in DM./cu. ft. according to the type of wood, for a given distance, and the basic wage rate and piece-work rate with supplements for cordwood skidding. Arguments in favour of skidding by the forest owner are that damage to regeneration or to forest roads can be avoided or lessened; extraction can be done to a time-table, enabling regeneration or tending measures to be undertaken as desired; and cord- and firewood may find a readier sale.

2930. BENNETT, W. D. **The transportation of pulpwood in flumes.** *Woodl. Res. Index Pulp Pap. Res. Inst. Can.* No. 97 (*B*-9-*d*), 1956. pp. 141 + xiv. 70 refs.

Covers the general history of flumes, the use of various types for transporting pulpwood, design and hydraulics, water supply, construction, maintenance, operation and economics, description of 21 flumes operating in Eastern Canada, glossary and engineer's tables.

2931. PUTKISTO, K. Hinausvastus juonnettaessa puutavaraa traktorivintturilla. **[Towing resistance in the skidding of timber by tractor winch.]** *Tied., Metsäteho, Helsinki* No. 121, 1956. pp. 3. 4 refs. [Fi.e.]

Skidding resistance increased linearly with increasing bundle size but average values, when skidding bundles of $\leqslant 0{\cdot}50$ solid cu.m. on sites of different degrees of difficulty, were $<$ 350 kg. weight. The standard winch used for loading (500 kg. weight) should therefore be adequate for skidding when mounted on a tractor. [Cf. *F.A.* 15 No. 2574.] *From author's summary.*

2932. HENNING, F. W. Praktische Erfahrungen beim Rücken von Holz an Steilhängen mit Rolle und Seil. **[Practical experiences in skidding wood on steep slopes with a pulley and cable.]** *Forstarchiv* 27 (5), 1956 (112–3). 1 ref. [G.]

Skidding uphill was carried out by the method suggested by Hilf [see *F.A.* 15 No. 3645], using a pair of horses instead of a motor winch, to save expense. At the top of the slope a pulley was fastened by a short cable at a height of 5 m., and at the bottom a second pulley at a height of 1 m. As skidding distances became greater, 4 men were needed, on a relay system, to take the cable down to be fixed to the next log. Long or heavy logs were cross-cut once to make work easier for the horses. Data are given on the total volume of logs, pulpwood, and firewood skidded, on the costs of the operation, prices obtained and total profit.

2933. BRYNTE, B. Lunning med vinsch i österrikiska alperna. Inntryck från en studieresa. **[Winch skidding in the Austrian Alps. Impressions from a study tour.]** *Skogen* 44 (4), 1957 (102–4). [Sw.]

Describes methods and equipment, and includes photographs of chutes, a cableway, and the Zwergkuli, Kernhofer Yarder and Bergkuli winches.

2934. **Trial of aerial wireway.** *Rep. Dep. Agric. Seychelles 1955*, 1956 (16–7).

Trials were made of a light galvanized mild-steel wire (No. 6 gauge) for a light-load aerial cableway, with which to extract forest produce (posts, planks, charcoal etc.) over difficult terrain. The distance covered from point to point was limited to $\frac{1}{4}$ mile to avoid undue sag and strain on the wire. Loads of 60–150 lb. were tried and results indicated that a load of ca. 85–100 lb. could be used safely. A duel parallel cable wound on two halves of the same drum enables used pulleys to be returned as the next load goes down, and if necessary the two cables can be used together to carry a heavier load.

2935. TRIPP, J. **Rubber tires: a new concept of logging.** *Sth. Lumberm.* 194 (2420), 1957 (60–62).

Chiefly a discussion of the advantages of rubber-tyred, self-powered logging arches over lorries and crawler tractors; these include conservation of the residual stand and of roads, which can be simple tracks and quite steep.

2936. LOYCKE, H. J. Forstliche Kleinschlepper. **[Small tractors for forestry.]** *Forstarchiv* 28 (1), 1957 (21–4). [G.]

Tabulates details of motor h.p. and weight of 13 tractors of German make; 10 are single-axled tractors and 3 small diesel 4-wheeled tractors. Data are also given on attachment devices and possible uses of each tractor.

2937. HARALDSEN, H. F. Skogens produkter med jernbanen. **[Sending forest products by rail.]** *Norsk Skogind.* 11 (1), 1957 (22–7). [Nor.e.] P.R.

Makes recommendations for ensuring better use of the railways (provision of adequate rolling stock and better circulation, and improved loading equipment), and gives details of amounts already carried by rail, and loading and unloading equipment.

378. Water Transport

2938. **Ice-free waterways.** *Timb. Tr. J.* 220 (4192), 1957 (89–90). 1 ref.

Gives extracts from the booklet 'Ice-free fairway of Lake Mälaren' and includes the following estimates for keeping open the 62-mile waterway between Västerås and Södertalje (Sweden): Installation for 8 compressors supplying 5700 cu.ft./min., £138,000. Annual costs: electricity, £2600; labour £690; interest (6%) £4150; 10-year depreciation £13,800, total £21,240. [Cf. *F.A.* 18 p. 147.]

38. Forest Engineering

383. Roads and Bridges

See also Nos. 2901, 3237–9, 3245–6.

2939. SCHWEIGLER, W. Neuzeitlicher Wegebau. **[Modern road-building.]** *Forstarchiv* 28 (2), 1957 (25–33). 11 refs. [G.]

Reviews the development of road-building in the last two decades and comments on modern techniques and machinery. The improvement in road-building methods is illustrated with reference to Furtwangen in the Black Forest.

2940. STOLAŘÍK, R. Hospodaření na lesních silnicích. **[Utilization of forest roads [in Czechoslovakia].]** *Sborn čsl. Akad. zeměd. (Lesn.)* 29 (9), 1956 (671–86). 20 refs. [Cz.cz.g.russ.*g.russ.*]

Recommendations for the best interim use and upkeep of the forest roads, which need reconstructing for modern motorized extraction. Appropriate thicknesses of road surface layers are tabulated for different materials and traffic loads. The thickness of the gravel layer is calculated according to a new method involving the modulus of deformation, which takes into account both soil type and local climate. The required width of roads and of wheel-track strips for different types of vehicle, soil, and climate are discussed.

2941. HARRISON, W. C. **Primary and secondary access over muskeg in forestry practice.** *Technical Memorandum, Associate Committee on Soil and Snow Mechanics, National Research Council, Ottawa* No. 38, 1955 (6–13). L.S.

Discusses the problems arising in building both access roads for light traffic and combined access and haul roads, to carry heavy pulpwood loads, across muskeg in Ontario and Manitoba. Both all-weather roads and winter roads, as required by the pulpwood logging companies, are discussed.

2942. MACFARLANE, I. C. **Techniques of road construction over organic terrain.** *Repr.* from *Roads and Engineering Construction [Toronto]* 94 (7), 1956. pp. 8. 4 refs.

A review of methods used for road construction across peat bogs, muskeg etc. in various countries, including the following classes of construction: excavation (total or partial); displacement (gravity or blasting); piles; floating road.

2943. AGER, B. H. Packad snö som transportunderlag. **[Packed snow as a foundation for transport.]** *Norrlands SkogsvFörb. Tidskr.* 1956 (3), (293–384). 23 refs. [Sw.sw.e.]

Discusses the results of experiments on the bearing strength of snow roads compacted by different equipment (e.g. rollers, scrapers), and the effect of the period between compaction and use by traffic and of different types of traffic on bearing strength.

2944. TAIVAINEN, O. A. **Keeping roads open.** *Finnish Paper and Timber, Helsinki* 8 (1), 1957 (5–8). [E.]

Discusses the extent to which roads are kept open in Finland, describes preparatory measures, and methods and equipment used in clearing roads, preventing drift formation, and reducing skidding. In 1955, maintenance costs in winter averaged about 7600 marks/km. and in summer about twice that amount.

2945. MOLL, E. Wegunterhaltung mit Motorstrassenhobel. **[Road maintenance with motor graders.]** *Holz-Zbl.* 83 (10), 1957 (107–9). [G.]

A description of the German Frisch motor grader and its day-to-day use in various types of maintenance work in the forest district of Weingarten (Baden) at costs much lower than those of manual work.

2946. FLACHBERGER, K. Zeitgemässe Aufschliessung im Gebirge unter Berücksichtigung des Maschineneinsatzes. **[The opening-up of mountain areas by modern mechanized methods.]** *Öst. Vjschr. Forstw.* 97 (3/4), 1956 (168–73). [G.]

Deals with road-building in rock in the Reichraming (Upper Austria) area, using compressed-air lines, 500–1000 m. long, with connexions for pneumatic drills at 50-m. intervals. With the help of other road-building equipment, up to 100 m. of road were built in a day.

384. Protective Works, including Torrent Training

See also No. 2446.

2947. CAPPUCCINI, G. Nuovo sistema per la correzione dei torrenti in esperimento in Jugoslavia. **[A new system of torrent training under experiment in Jugoslavia.]** *Monti e Boschi* 8 (1), 1957 (17–20). [It.]

Describes, with photographs, a system of torrent training invented by Prof. Rosic of Belgrade University, the main object of which is to increase subterranean at the expense of surface flow. Instead of ordinary check-dams, a concrete drain with apertures on the top surface and at the sides is constructed, so that flood water flows into it and (to a great extent) seeps out. Lateral channels can be added if necessary.

385. Drainage, Irrigation, Sedimentation. Water Supply

2948. LUNDBERG, G. **Observations on the location of forest drains.** [Forest Research Institute, Rotorua, New Zealand. [1956]. pp. 4. Transl. from *Skogsägaren* 1952 (9), (195–9). Limited distribution.

4. FOREST INJURIES AND PROTECTION

See also Nos. 2598, 2669, 2837.

41. General Technique of Forest Protection. Types of Injury

See also No. 2901.

2949. SCHINDLER, U. Rückenspritzen für den Forstschutz. **[Knapsack sprayers for forest protection.]** *Forstarchiv* 27 (2), 1956 (43–4). [G.]

Describes and illustrates 6 commonly used, hand-operated, portable sprayers, including automatic (e.g. compressed-air) types, and their accessories, with data on method of working, pressures, volume, weights, and costs, uses, and relative merits.

2950. GUSOVIUS, O. Tragbare Motor-Sprüh- und Stäubegeräte für den Forstschutz. **[Portable motor spraying and dusting equipment for forest**

protection.] *Forstarchiv* 27 (4), 1956 (100). 1 ref. [G.]

Technical data and costs are tabulated for 4 German makes: Solo-Port, Fontan, ASI and Blasator. All are illustrated.

2951. LABROUSSE, G. Démonstrations avec le 'Pulsoréacteur Agricolavia'. **[Demonstrations of the 'Pulsoréacteur Agricolavia'.]** *Agron. trop.* 11 (6), 1956 (778–82). [F.]

Describes a new and improved fogging device powered by a pulse jet engine, which is lighter and less cumbersome than the 'Swing Fog' [cf. *F.A.* 16 p. 154], but not less noisy. It is mounted on a 'Unimog' chassis and can be used to distribute insecticidal or fungicidal dusts, aqueous or oily solutions, fertilizers etc. It weighs only 100 kg. plus 300 kg. for reservoirs, compared with some 800 kg. for the ordinary power sprayer, and can therefore be mounted on a Landrover, jeep etc. Petrol consumption, during tests on plantations in Morocco, was 1 litre/ha., and performance 70 ha./hour.

2952. EDLIN, H. L., and NIMMO, M. **Tree injuries [in Great Britain]: their causes and their prevention.** Thames & Hudson, London. 1956. pp. 167. 40 refs. Price 21*s.*

Comments on 125 photographs illustrating injuries due to climate, direct and indirect action of man, mammals and birds, insects, climbing and parasitic higher plants, fungi, old age and deformities.

42. Injuries from Inorganic Agencies other than Fire

See also No. 2409.

421. Air Currents

See also Nos. 2714, 2869, 2957, 3201.

2953. KÖSTLER, J. N. Waldbauliche Beobachtungen an Wurzelstöcken sturmgeworfener Nadelbäume. **[Silvicultural observations on the roots of windthrown conifers.]** *Forstwiss. Cbl.* 75 (3/4), 1956 (65–91). Many refs. [G.g.]

Detailed observations were made in a private forest 40 km. north of Munich on the root systems of trees uprooted in the storm of 17 Jan. 1955, and the silvicultural significance of the findings is discussed. Species studied were Spruce, Silver Fir, Douglas Fir, White Pine and Scots Pine. Development was very variable from tree to tree, but each species showed certain definite tendencies. Contrary to the usual assumption, the Pine had only a moderately deep root system and suffered the same degree of windthrow as the other species; it therefore profits by being mixed with Fir or with deciduous species. Douglas cannot replace Silver Fir, but it is worth trying out in groups where seed can be obtained from locally tested trees.

2954. MEYFARTH, H. Schnee- und Sturmschäden im Thüringer Wald. **[Damage by snow and wind in the Thuringer Wald.]** *Forst u. Jagd* 5 (2), 1955 (53–6). [G.]

Describes the effect of two gales on heavily snow-laden Spruce forests in 1952/53, and salvage operations. Preventive measures advocated include formation of mixed uneven-aged stands, wide spacings, and the use of local races, as these have shown themselves to be much more resistant, particularly at high altitudes, than imported strains.

422. Temperature Influences. Frost. Heat. Drought

See also Nos. 2406, 2578–80, 3027, 3113, 3295.

2955. FLOROV, R. Vlijanie na maïskite studove vărhu obiknovenija buk i izvodi na văzobnovjavaneto mu. **[Effect of May [late] frosts on *Fagus [moesiaca?]* and some remarks on its regeneration.]** *Gorsko Stopanstvo* 10 (8), 1954 (355–8). [Bulg.]

The most sensitive organ of Beech being its flowers, the cold weather in May 1952 caused a very low seed yield in Bulgaria.

2956. DUGELAY, A. Observations générales sur la gelée de février 1956 dans les départements des Alpes-Maritimes et du Var. **[General observations on the frost of Feb. 1956 in the departments of Alpes-Maritimes and Var.]** *Rev. for. franç.* 9 (1), 1957 (1–27). [F.]

Notes on the effect of severe frost and heavy snow on a number of native and exotic species.

2957. ROBERT, J. Encore les effets de la bise de février 1956. **[Delayed effects of the icy winds of February 1956.]** *Forêt, Neuchâtel* 10 (5), 1957 (112–4). [F.]

Describes effects, first discernible in September and increasing later, on old and medium-aged Spruce. In the Vallée de Joux (Vaud) at 1100–1250 m., all trees on some sites had a scorched appearance, followed by needle cast, on their N.E. side; on other sites, only some were affected, presumably where the sap had begun rising. In many trees the bark of the stem in the crown region on the affected side was also quite dry.

2958. GUINAUDEAU, J. Effets des grands froids de février 1956 sur les espèces forestières des landes de Gascogne. **[The effects of the severe cold of February 1956 on forest species of the Gascony landes.]** *Rev. for. franç.* 9 (1), 1957 (28–33). [F.]

Temperatures as low as — 19° C. were experienced. Notes are given on the effect of this severe cold on a number of native and introduced species including several Eucalypts.

2959. Torkskador i Stockholms län. **[Drought damage in Stockholm county.]** *Skogen* 44 (6), 1957 (170–1). [Sw.]

Summarizes discussion on: direct damage by drought (*E. Björkman*); damage to plantations (*E. von Hofsten*); and insect damage following the drought (*B. Lekander*), as a result of the dry summer of 1955.

423. Precipitations

See also Nos. 2954, 2956, 3039, 3201.

2960. CARVELL, K. L., TRYON, E. H., and TRUE, R. P. **Effects of glaze on the development of Appalachian hardwoods.** *J. For.* 55 (2), 1957 (130–2).

Presents the results of a survey made in spring 1956 to determine the extent of damage caused by a glaze storm in the previous January in the Cheat Mt. range, N. West Virginia. On 68 acres all broken trees were examined, and species, crown class and nature of injury recorded. Dominants and co-dominants suffered most; there was almost no breakage in intermediate and suppressed trees. Damage was most serious in *Liriodendron tulipifera*, *Quercus prinus*, *Prunus serotina* and *Quercus rubra*. Saplings on the edge of openings, particularly on the windward side, were frequently bent to the ground. Most of the bent trees righted themselves during the spring. Crown-thinning plots established in 1954 and 1955 were more subject to injury than unthinned stands, the % of damaged trees increasing with the intensity of thinning. Crooks are observed on the boles of many *L. tulipifera* in this area, probably caused by past glaze storms, a lateral branch taking the place of the broken leader. Where glaze storms are frequent, even-aged stands may be preferable to uneven-aged; frequent light crown-thinnings removing > 30% of the volume would tend to strengthen dominants and co-dominants. A series of light improvement cuttings should be made of sapling stems with forks, crooks or disease.

424. Soil Conditions. Erosion Effects. Nutrient Deficiencies etc.

See also Nos. 2580, 2599, 2777, 3156.

2961. VERGNANO, O. Caratteristici effetti del boro su piante di olmo e pioppo nella zona dei soffioni boriferi di Travale. **[Typical effects of boron on Elms and Poplars in the zone of the boron-bearing steam vents of Travale.]** *Nuovo G. bot. ital.* (*n.s.*) 60 (1/2), 1953 (225–9). 5 refs. [It.e.] A.P.B.

The high B content of the soil in this area produces symptoms of injury in the leaves of Poplars and Elms but not of Oaks. The symptoms are described and the B concentration of Elms recorded—1000 p.p.m. B_2O_3 in leaf dry matter.

2962. DUCHAUFOUR, P. Un cas de carence azotée de l'épicéa décelée par le diagnostic foliaire. **[A case of N deficiency revealed by foliar analysis.]** *Rev. for. franç.* 9 (2), 1957 (128–35). [F.]

In a mixed Spruce/Silver Fir stand, where the majority of trees (*a*) were obviously suffering from some nutrient deficiency while some other groups (*b*) were much more vigorous, it was first noted that (*a*) coincided with a *Calluna*-dominated ground vegetation. Soil analysis showed a high C/N ratio and adequate bases under (*a*) and little difference in P between (*a*) and (*b*). Foliar analysis confirmed that the high C/N ratio represented a marked deficiency of N in (*a*), and also revealed a rather low P content in both (*a*) and (*b*).

2963. KARSCHON, R. **The leaf iron contents of *Eucalyptus camaldulensis* Dehn.** [*E. rostrata*]. *La-Yaaran* 7 (1/2), 1957 (5–7, 28–26). 6 refs. [Heb.e.]

Tabulates the mean Fe in p.p.m. of dry leaf for 21 plots on 5 calcareous and 2 non-calcareous soils. Both high and low values are found both on chlorosis-inducing soils and on those free from active Ca. Fe chlorosis in this Eucalypt is not a true deficiency similar to that of Citrus. [Cf. *F.A.* 18 No. 1742.]

425. Chemical Influences (Atmospheric)

See also No. 2473.

2964. WENTZEL, K. F. Die Verantwortlichkeit von Industrie- und Hausfeuerung für Wald-Rauchschäden und Luftverschmutzung. **[The part played by industrial and domestic smoke in damage to forest by fumes and in atmospheric pollution.]** *Forstarchiv* 27 (4), 1956 (84–9). 11 refs. [G.g.]

From a survey made in the Ruhr, the author concludes that industrial fumes are almost exclusively responsible for damage to vegetation. An instance is cited of a Pine stand greatly improving its rate of growth after the dismantling of an industrial plant near by.

2965. EDLIN, H. L. **Saltburn following a summer gale in south-east England.** *Quart. J. For.* 51 (1), 1957 (46–50).

On 29 July, 1956, a south-westerly gale of unusual violence swept Britain, and its effects on trees in the S.E. are here discussed. Trees of most kinds near the coast showed extensive browning of leaves, followed by partial or complete defoliation, on their seaward side, due to the deposition of salt. The varying susceptibility of different species is reviewed. Saltburn could be observed up to 50 miles inland and 750 ft. above sea level, but only on exposed ridges where the flow of air is apparently concentrated. Some trees near the coast put out fresh foliage, and even flowers. Although broadleaved trees were in full leaf, comparatively few were uprooted. *Author's summary.*

43. Forest Fires

2966. FROST, F. **Forest fire protection in Newfoundland.** *Pulp Paper Mag. Can.* 57 (13), 1956 (146, 148).

Outlines the organization and allocation of responsibility for fire protection, and tabulates for the years 1930, '35 . . . '55, the expenses incurred and the contributions by government and 3 forest corporations, and for the years 1946–55, by stand types, the annual acreage burned.

2967. NEWCOMB, L. S. **The Osceola fire and the timber salvage operation.** *Sth. Lumberm.* 193 (2417), 1957 (39–41).

Description of a very extensive and destructive fire in Florida in 1956, after 2 years of drought, its causes (uncontrolled prescribed burning and change of wind), the fire-fighting, damage done (worst on dried-out ponds and swamps and where 'roughs' were > 3 years old), and details of the timber salvaged and sold. The need for better weather forecasting, more prescribed burning, and more access roads is stressed.

432. Prevention and Control

See also No. 2670.

2968. ZIEGER, E.; SCHWARTZ, H. Vorbeugender Brandschutz durch Waldbaumassnahmen. Neue

Wege im Waldbauschutz. **[Fire prevention by silvicultural measures. New methods of silvicultural protection.]** *Forst u. Jagd* 4 (5), 1954 (167–72). [G.]

Both articles deal with live firebreaks in E. German Pine woods or plantations, their treatment, width, direction, and spacing. Zieger recommends 300 m.-wide strips of widely spaced Pine, or possibly Robinia (but not Birch), pruned to 2 m. and kept free of ground vegetation by mechanical cultivation. Schwartz makes suggestions for deciduous trees and shrubs for narrower firebreaks on various sites.

2969. WILSON, C. C. **Helitack.** *Proc. West. For. Conserv. Ass.* 1956 (59–61).

An account of accessories being developed and tested by the California Forest and Range Experiment Station, to equip helicopters for fire-fighting (e.g. hose-laying equipment, a pressurized tank to expel water or chemical fire-retardants by rocket power etc.).

434. Revegetation etc. of Burnt Areas

See No. 2790.

435. Benefits of Fire Control. Injurious Effects of Fire

See Nos. 2859, 3012, 3123.

436. Beneficial Effects of Fire. Uses of Fire in Silviculture and Other Forms of Husbandry

See also Nos. 2462, 2859, 2975.

2970. TARRANT, R. F. **Effects of slash burning on some soils of the Douglas Fir region.** *Repr.* from *Proc. Soil Sci. Soc. Amer.* 20 (3), 1956 (408–11). 11 refs.

Summarizes published and unpublished results of research [cf. *F.A.* 15 No. 2609; 16 Nos. 2595; 2775; 17 No. 291] and stresses the fact that severe burns (with heavy or concentrated fuel) occurred only on 2·8% of the test areas, light burns on 47·1%, the rest being unaffected. Analysis of physical soil properties showed a serious lowering of the percolation rate by severe burning in two soils analysed (a pumicy sandy loam and a sandy clay loam), but the general effect on moisture properties of the cutting areas studied was of minor importance. One year after burning, 65% of 1-year-old seedlings on unburned soil had external mycorrhizae, against 40% on burned soil; a year later the figures were 100 and 79%.

2971. WEAVER, H. **Effects of prescribed burning in Ponderosa Pine.** *J. For.* 55 (2), 1957 (133–8). 7 refs.

Presents data up to 1955 on the results of the operations already described. [See *F.A.* 10 No. 1748.]

2972. BISWELL, H. H., and SCHULTZ, A. M. **Reduction of wildfire hazard: correct timing of prescribed burning of dead vegetation in timber reduces danger of uncontrolled fires in those areas.** *California Agriculture, Berkeley, Calif.* 10 (11), 1956 (4–5).

Progress report on a University of California project to study prescribed burning in second-growth Ponderosa Pine at Hobergs, Lake County. Records are being kept of the number of days, during the dormant period, on which burning can be done safely and effectively. From the point of view of not damaging trees, it should be stopped when air temperatures reach 75° F., or when trees break dormancy.

2973. CHANDLER, C. C. **'Light burning' in southern California fuels.** *For. Res. Note Calif. For. Range Exp. Sta.* No. 119, 1957. pp. 2. 1 ref.

Light burns were made in 1954 in 3 types of vegetation. Only Sage, the lightest type of fuel, burned completely; *chamise* burned very little and scrub Oak not at all. In the conditions prevalent in S. California, light burning does not reduce the fire hazard.

2974. TEVIS, L., JR. **Effect of a slash burn on forest mice.** *J. Wildlife Mgmt.* 20 (4), 1956 (405–9). 10 refs. B.A.P.

[Cf. *F.A.* 17 No. 2929.] On a 16-acre felled area in the California Douglas Fir region, 41 mice were captured, marked, and released before slash burning. After burning, 13 marked individuals were found in the forest and 4 on small unburned islands in the centre of the felled area. Except for these 4 the fire had killed or driven out all mice on the burned area. However, after rain had settled the ashes, the area was reinvaded, and in the space of 2½ weeks 72 mice were trapped. *From author's summary.*

44. Damage by Harmful Plants. Virus Diseases

441. Weeds

See also No. 2857.

2975. SAMPSON, A. W., and SCHULTZ, A. M. **Control of brush and undesirable trees. III. Methods and equipment for controlled burning. IV. Conservation in land clearing.** *Unasylva* 10 (4), 1956 (166–82); 11 (1), 1957 (19–25).

[Cf. *F.A* 18 No. 1760.] The 4 articles are to be reprinted in pamphlet form.

Weeds: Chemical Control

See also Nos. 2463, 2764, 2846–50, 2892, 2904–8, 2992–3.

2976. BYLTERUD, A. and HØIE, K. L. Bedre utstyr for sprøyting mot ukrutt. **[Improved equipment for controlling weeds [and weed trees] by spraying.]** *Norsk Skogbr.* 3 (2), 1957 (45–6, 48). [Nor.]

In preliminary experiments on Birch, using 3 commercial sprayers, two of the normal pressure type and one of the mist type incorporating a motor-driven fan, all carried on the back, good control was obtained with all three. A type of sprayer designed by A. Bylterud for basal spraying, with the nozzles mounted on two flexible metal tubes allowing both sides of the tree to be sprayed at once, is described and illustrated. Its use in nurseries is also discussed.

2977. RUDOLF, P. O., and WATT, R. F. **Chemical control of brush and trees in the Lake States.** *Sta. Pap. Lake St. For. Exp. Sta.* No. 41, 1956. pp. 58. 80 refs.

2978. LEONARD, O. A., and HARVEY, W. A. **Chemical control of woody plants in California.** *Bull. Calif. agric. Exp. Sta.* No. 755, 1956. pp. 40. 12 refs.

2979. WALKER, L. C. **Controlling undesirable hardwoods [in Georgia].** *Rep. Ga. For. Res. Coun.* No. 3, 1956. pp. 24.

Practical instructions for foresters on the use of mechanical methods, chemical methods, fire, and combinations of these, to control undesirable hardwoods, mainly on cut-over Pine lands.

2980. LITTLE, S., and MOHR, J. J. **Chemical control of hardwoods on Pine sites of Maryland's eastern shore.** *For. Res. Note. Ntheast. For. Exp. Sta.* No. 64, 1956. pp. 4. 5 refs.

To determine the best local means of control, 9 chemical treatments and girdling were tried in Jan. 1953 on worthless hardwoods > 4 in. in diam., the commonest species being White Oak, Post Oak, Black Oak, Southern Red Oak, Willow Oak, Red Maple, Blackgum and Sweetgum. The treatments were (1) basal spraying with (*a*) 2% and (*b*) 4% 2,4,5-T in oil, (2) Ammate crystals in notches or cups, (3) 2 lb. of Ammate/gal. water in frills, (4) frilling using (*a*) 1%, (*b*) 2% or (*c*) 4% 2,4,5-T in water, (5) frilling using (*a*) 1% or (*b*) 2% 2,4,5-T in oil. The basal spray treatments were applied to 24 and 77 trees; each of the other treatments to 127–178 trees. Effectiveness varied with the species. After 2 years (1) (*b*) had killed all Red Maple and 64% of the Oaks, (2) was most effective against Sweetgum and Blackgum. Blackgum and Red Maple were relatively resistant to (4). Sprouting was not greatly reduced by (4) and (5), but studies in other regions suggest that it might have been reduced and stem mortality raised if treatments had been applied in the growing season. Frilling treatments cost least, girdling slightly more, and basal spraying and Ammate crystals most. The high cost of basal spraying prohibits its use on large trees; (5) (*b*) is recommended as being cheap and effective.

2981. GRELEN, H. E. **How about helicopters for sand-hill scrub Oak?** *Sth. Lumberm.* 193 (2417—Christmas No.), 1956 (247–8).

Scrub Oak on Florida sandhills was sprayed by helicopter with 9 different growth-regulator herbicides, dyed red. So far, none of the preparations has given a satisfactory kill, but from an operational point of view the trials were successful. Good coverage was obtained and little drift observed.

2982. WEBSTER, J. E., and ELDER, W. C. **Chemical analyses of Post Oak (*Quercus stellata*) to determine food reserves of stumps and roots treated with herbicides.** *Abstr.* in *Res. Rep. 12th ann. Nth. Cent. Weed Control Conf.* 1955 (186). O.R.E.

Some large, uniform trees were selected and divided into 4 groups: (1) left undisturbed, (2) felled 18 in. from ground level and treated heavily with a mixture of 2,4-D and 2,4,5-T esters in diesel oil, (3) felled and allowed to coppice, and (4) felled and coppice shoots removed. Samples were taken and chemical analyses made over a period of 3½ years. In all stumps total N was low in July with peaks from March to May; the treated stumps (t.s.) although apparently dead, still maintained a supply of N similar to that of untreated stumps (u.s.). Soluble solids did not vary as much as the total N, but their content in t.s. was somewhat lower than in u.s. Total sugars reached a peak in midwinter, and a low period from March to May. They maintained the same level in t.s. and u.s. for a considerable time after chemical treatment. In the roots, soluble solids and total sugars varied in the same way as in the stumps. Total N in the roots, however was more constant throughout the year, and only slightly lower in the t.s. than in the u.s.

2983. MCQUILKIN, W. E. **The key to effective basal spraying of woody plants: wet the root collar.** *J. For.* 55 (2), 1957 (143–4). 2 refs.

Experiments made on clumps of scrub Oak in N.E. Pennsylvania in July 1953, confirmed the finding that when a spray of 2,4,5-T is directed at the root collar, all the plants are killed and sprouting does not take place. When 12–18 in. of the stem base was sprayed in the usual way, dormant buds at the root collar were not killed and many plants recovered. [Cf. *F.A.* 14 No. 2234; 17 No. 541.]

2984. BERGESON, E. D., and LORENZ, R. W. **Seasonal effectiveness of 2,4,5-T basal sprays for eradicating *Ribes* in White Pine blister rust control in Illinois.** *J. For.* 55 (1), 1957 (17–9). 2 refs.

In 1952, three sets of test plots, each $\frac{1}{40}$ of an acre, were laid out in stands of White Oak in which *Ribes missouriense* bushes averaged 2000/acre. Three formulations of (*a*) 6, (*b*) 12, or (*c*) 18 lb. of effective 2,4,5-T acid/100 gal. fuel oil were applied monthly from July 1952 to June 1953; the basal 6 in. of the stem was sprayed to the point of run-off. In addition, on each of 2 plots, 80 *Ribes* bushes were treated monthly from Aug 1953 to March 1954 with 6 and 12 lb. 2,4,5-T/100 gal. oil. Results show that treatments (*a*), (*b*) and (*c*) killed 96, 97, and 99% respectively of *Ribes*; analysis of the results reveals that the treatments were as effective for the 6-month period of dormancy as for the growing season; all the 160 bushes treated during the dormant season were completely killed. Treatment (*c*), using a higher concentration, cost twice as much as (*a*). Treatments may be carried out effectively during the winter months when labour is more readily available.

2985. **[Trials of arboricides in Gambia.]** *Rep For. Adv. Gambia 1954*, 1956 (3).

Some proprietary arboricides, consisting mainly of 2,4-D and 2,4,5-T, were tested on a small scale and found to be effective in killing *Parkia filicoidea*, *Albizzia zygia*, *Pterocarpus erinaceus* and *Lannea* spp., but not *Terminalia macroptera*, by ring barking and spraying.

2986. **[Tests of arboricides in East Africa.]** *Colon. Res., Lond. 1955/56*, 1956 (194).

The Colonial Insecticides Research Unit has made a number of trials of arboricides, applied by ground spraying. It appears probable that many of the more troublesome tree and shrub species in Tanganyika can be killed, and regeneration prevented or inhibited for some time, by spraying with solutions of 2,4,5-T or 2,4-D esters. Some species of *Lannea* (*L. triphylla* and *L. humilis*) and of *Commiphora* (*C. schimperi* and *C. subsessifolia*) are susceptible to 0·5% concentrations of 2,4,5-T. Some *Combretum* species appear to be more resistant, but *C. zeyheri* has been killed by a basal spray of 2·5% 2,4,5-T with little regeneration after 10 months. Large *Acacia senegal* have been killed by 3% 2,4,5-T applied to frills. Two trees of particular importance at higher altitudes in Kenya are *Euclea divinorum* and *Tarchonanthus camphoratus*, and preliminary results indicate that the former is relatively resistant to 2,4-D and 2,4,5-T; further experiments on these species are in progress.

2987. **[Chemical control of Stinging Tree (*Laportea moroides*).]** *Rep. Dir. For. Qd. 1955/56*, 1956 (11).

A complete kill of young *L. moroides* up to 6 in. high was obtained by spraying with United Selective Weedkiller (a 2,4-D preparation) in strengths of 0·067–0·2% on plots for the study of regeneration in tropical rain forest. There was no observed damage to small seedlings of desirable species on the treated plots.

442. Parasitic Higher Plants. Climbers and Epiphytes

2988. HAWKSWORTH, F. G. **Notes on the host relationships of *Arceuthobium americanum* and *A. vaginatum* f. *cryptopodum*.** *Plant Dis. Reptr.* 40 (3), 1956 (252). A.P.B.

A. americanum was found on Ponderosa Pine and *A. vaginatum* f. *cryptopodum* on Lodgepole Pine where naturally infected trees of these two species were intermixed in the Roosevelt National Forest, Colorado.

2989. KUIJT, J. **A new record of dwarf mistletoe on Lodgepole and Western White Pine.** *Madroño, Berkeley, Calif.* 13 (5), 1956 (170–2). 1 ref. E.B.

The occurrence of *Arceuthobium campylopodum* on *Pinus contorta* var. *latifolia* and *P. monticola* was noted in the Pacific coast region of British Columbia in 1954. The author suspects that this may be the variety of *A. campylopodum* that is found on Western Hemlock.

2990. WAGENER, W. W. **The limitation of two leafy mistletoes of the genus *Phoradendron* by low temperatures.** *Ecology* 38 (1), 1957 (142–5). 3 refs.

The role of low temperatures in limiting the incidence and range of two species of *Phoradendron* (*P. villosum* and *P. densum*) occurring on conifers on the Pacific coast, was examined after a period of intense cold in California, and the data confirm the theory that occasional low temperatures (below zero F.) operate to restrict their range. Young plants often survive with some injury, when older and well developed ones are killed.

2991. BALLE, S. Études sur les Loranthoidées africaines. **[Studies on the African Loranthoideae.]** *Bull. Soc. Bot. Belg.* 88, 1956 (133–46 + 1 plate). [F.] O.B.D.

Describes *Berhantia senegalensis* gen. et sp. nov., found on *Combretum glutinosum*, and the new species *Phragmanthera vignei* (hosts unknown) and *Tapinanthus voltensis* (variety of hosts).

2992. **Mistletoe control.** *Rep. For. Timb. Bur. Aust. 1955*, 1956 (27).

Examinations were made of two experiments in which trees [?Eucalypts] were re-treated with 2,4-D. The first, in which the tree had never carried mistletoe, indicated that a tree treated for the second time reacted in the same manner as one treated for the first time, i.e. neither susceptibility nor immunity was acquired. The second, in which the trees had carried mistletoe before the first treatment, some of which survived, showed that a second treatment could either kill or injure the surviving mistletoe without unduly harming the tree. It was observed that some of the trees freed of mistletoe were soon reinfested. [Cf. *F.A.* 17 No. 551.]

2993. **[Chemical control of Rubber Vine (*Araujia albens*).]** *Rep. Dir. For. Qd. 1955/56*, 1956 (15).

Even with repeated applications, 2,4-D and 2,4,5-T will control the vine for a short period only. Amizol (3-amino-1,2,4-triazole) continued to show promise and is to be tested on a large scale. Amizol is translocated very readily in *Araujia*, so that the costly brushing of the vine from trees before treatment is unnecessary even with low-volume applications.

443. Fungi and Bacteria

See also Nos. 3059, 3061, 3065, 3152.

Fungi and Bacteria: Chemical Control

See Nos. 2949–51, 2995, 2997–9, 3016, 3043.

443.2. Diseases of Seed and Seedlings; Damping Off etc.

2994. ZAŠEV, V. Njakolko važni găbni bolesti v našite gorski razsadnici i borbata sreštu tjah. **[Some important fungal diseases in the forest nurseries of Bulgaria and their control.]** *Gorsko Stopanstvo* 10 (2), 1954 (69–74). [Bulg.]

Describes the damping-off of seedlings, infection by *Lophodermium pinastri*, *Microsphaera quercina*, *Rosellinia quercina*, *Ceratophorum setosum* and *Melampsora larici-populina*, and methods used for their control.

2995. PŘÍHODA, A. Hypermangan proti houbovým chorobám. **[The use of potassium permanganate against fungus diseases.]** *Lesn. Práce* 35 (3), 1956 (113–5). [Cz.]

Steeping seeds in 0·5% $KMnO_4$ for ½ hour before sowing, claimed by some to accelerate germination, certainly increases it by killing fungi. Spraying with a 0·5% solution (1% if the soil is moist) at 6–7 litres/sq. m. is also recommended against damping off. Although no seedlings except Silver Fir are

harmed by strong solutions, it is not economical to exceed 1%. $KMnO_4$ has several advantages over Bordeaux mixture for killing fungi in the root system; good results are reported from Czechoslovakia (both in stands and nurseries) from its use for protecting Scots Pine and Lime seedlings and in controlling *Microsphaera alphitoides* and *Sphaerotheca pannosa.*

2996. STROBEL, J., and VERMILLION, M. T. **A preliminary study of an apparent disease of Hemlock (*Tsuga canadensis* (L.) Carr.) in the nursery.** *Lloydia* 19 (4), 1956 (241–4). 3 refs. P.R.

Describes the symptoms and prevalence of the disease. The causal organism was isolated and identified as a species of *Cephalosporium.* The infection was not observed on forest plantings of *T. canadensis.*

2997. NOHARA, Y., and ITO, K. **[Researches on the prevention of needle blight of 'Sugi', *Cryptomeria japonica* D. Don. (IV). Falling of Bordeaux mixture from the seedlings.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 87, 1956 (59–65). 7 refs. [Jap.jap.e.e.]

Graphs show residual Cu on (*a*) 1-year and (*b*) 2-year seedlings at 10-day intervals up to 50 days after spraying with 3 concentrations. Cu decreased sharply on (*a*) and (*b*) for 20 and 10 days respectively, the rate of decrease thereafter diminishing continuously. As proved by the effect of Typhoon 13 of 1953, neither wind nor rain is important in this decrease.

2998. NOHARA, Y., and ITO, K. **[Researches on the prevention of needle blight on 'Sugi', *Cryptomeria japonica* D. Don. (V) Vanishing of dusting fungicides containing Cu-molecule from the seedlings.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 87, 1956 (67–73). 6 refs. [Jap.jap.e.]

Dusting with preparations containing (*a*) Cu_2O and (*b*) $CuCO_3$ was carried out on nursery beds of *Cryptomeria japonica,* and measurements made for 15 days at 3-day intervals to determine residual Cu. On 1-year seedlings more Cu of (*a*) adhered than of (*b*), a difference ascribed to the diluents. The residual Cu of (*b*) diminished faster up to the 3rd day, that of (*a*) after the 6th. Similar initial differences in rates of loss of Cu were seen on 2-year plants but disappeared after the 6th day. Rain increased Cu loss during the first 6 days but had no apparent effect later.

2999. GIBSON, I. A. S. **An anomalous effect of soil treatment with ethyl mercury phosphate on the incidence of damping-off in Pine seedlings.** *Phytopathology* 46 (3), 1956 (181–2). 3 refs.

Applications of Granosan (5% ethyl mercury phosphate; 3·8% Hg) as a 0·3% aqueous suspension at 0·5 gal./sq. yd. to *Pinus patula* and *P. radiata* at time of sowing resulted in greater losses from *Rhizoctonia solani* and *Pythium ultimum.* Possible causes investigated were (*a*) injury or reduced growth rate in the Pines, (*b*) selective effect favouring the pathogens in competition with microflora, (*c*) direct stimulation of the pathogen by weak doses. Both (*a*) and (*c*) were eliminated. It is concluded that the pathogens would be the earliest colonists in a sterilized soil from which the fungicide is gradually being leached because of a greater tolerance to higher concentrations of this poison than their competitors (fungi and bacteria).

3000. GEORGESCU, C. C. Tracheomicoza la *Elaeagnus angustifolia* produsă de *Fusarium oxysporum* Schlecht. var. *orthoceras* app. et wr. bilai comb. nova. **[Damping off of *E. angustifolia* caused by *E. oxysporum* var. *orthoceras* comb. nov.]** *Bul. şti. Acad. Repub. rom.* (*Sect. biol.*) 8 (3), 1956 (697–707 + tbl.). 11 refs. [Rum.rum.russ.f.] O.R.S.

Describes the cultural and morphological characters of the fungus, and successful attempts to produce symptoms by artificially infecting seedlings with inoculum.

3001. QURESHI, I. M. **Mortality of *Casuarina equisetifolia* in plantations in Bombay state.** *Proc. 8th silv. Conf., Dehra Dun 1951,* Part 2, 1956 (329–30).

Describes a sudden and virulent wilt of seedlings of *C. equisetifolia* and control measures taken against it. The causal organism may be *Macrophomina phaseoli,* which was isolated from wilted seedlings.

443.3. Diseases of Older Stages

Stem, Butt and Root Rots; Root Diseases

See also Nos. 2491, 2513, 2596.

3002. BASHAM, J. T. **A technique for the sterilization and inoculation of wood cut from living trees.** *Repr.* from *Canad. J. Bot.* 35 (1), 1957 (31–4 + 1 plate). 4 refs.

Describes a wood sterilization technique that leaves the wood almost unaltered, so that it can be inoculated in the laboratory under conditions as close as possible to those that exist when fungi attack a living tree. A healthy tree is felled and the bole cut into 10-in. bolts from which small test 'beams' $\frac{3}{8} \times \frac{3}{8} \times 7$ in. are made. When finished, each beam is immediately immersed in 70% ethanol for ca. 2 min., then removed with sterilized forceps, shaken gently to remove excess alcohol, and placed in sterile inoculation tubes. Radial sections of Balsam Fir sapwood 20μ thick were removed from the surface of beams 48 hours after treatment; microscopic plasmolysis tests showed that it does not kill or seriously affect the ray parenchyma. An inoculation tube has also been designed to support the beams a little above agar media so that the wood does not touch the medium but can contact mycelium growing upon it. This technique has been used successfully with Balsam Fir and 3 associated fungi —*Polyporus abietinus, Stereum chailletti* and one unidentified.

3003. **Thulium X-ray units to determine extent of decay in standing trees.** *Timb. Tr. J.* 220 (4196), 1957 (90).

The unit, consisting of a 13-lb. lead cylinder, 4 × 4 in., enclosing a pellet of Tm that produces the radioactive effect of a 100 Kvp X-ray apparatus, is fixed to the stem on the opposite side from a pliable

industrial film-holder, and the pellet is pivoted inside the sheath to the bark surface. Photographs taken round the periphery at known angles are read for density differences, visually or by 'densitometer', and in the latter case are graphed. Deviations from normal density indicate defects, e.g. decay, which can be plotted by triangulation across the horizontal plane, at repeated intervals, to show the development of rot in the living tree. The method will also simplify sampling procedure but its extension depends on the availability of Tm.

3004. RISHBETH, J., and MEREDITH, D. S. **Surface microflora of Pine needles.** *Nature, Lond.* 179 (4561), 1957 (682–3). 1 ref.

In E. Anglia, crowns of *Pinus sylvestris* and *P. nigra* var. *calabrica* bear large numbers of fungal spores; in early Dec. 1956 the rough counts per needle for a sample of foliage from a Pine plantation were: *Fomes annosus* 1, *Cladosporium* sp. 4, *Peniophora gigantea* 6, *Sclerophoma pithyophila* 14, and *Ophionectria cylindrospora* 60. The proportion of various species varies with locality, and in a given locality the spore population fluctuates with time probably through loss in viability and washing off by rain. *F. annosus*, *P. gigantea* and *Stereum sanguinolentum*, and bluestain and other wood-inhabiting fungi have been detected in water drops falling from the canopy just after rain.

3005. **Unidentified root rot and stem canker of Pines.** *Rep. For. Res. Inst. N.Z. For. Serv. 1955/56*, 1956 (18).

The pathogenicity of a fungus consistently isolated from diseased Pines was established by inoculation of potted *Pinus radiata* seedlings. It is believed that the infection was present in Manuka stands before Pines were planted on the affected sites. The disease appears to take 3–4 years to kill young trees in plantations of *P. radiata*, *P. elliottii*, and *P. taeda*.

3006. **Core rot and blue stain of living Radiata Pine.** *Rep. For. Res. Inst. N.Z. For. Serv. 1955/56*, 1956 (19).

A white rot and blue stain found in the heartwood of *Pinus radiata* in Naseby Forest, New Zealand, is dormant and is believed to have occurred before the onset of heartwood formation. The fungus appears to have gained entry through dead branches that lacked complete resin plugs, a lack that may be a symptom of the effect on the trees of the very severe site conditions.

3007. FREZZI, M. J. Presencia de *Botryosphaeria ribis* en la República Argentina y su importancia económica. [**The presence of *B. ribis* in the Argentine Republic, and its economic importance.**] *Revista de Investigaciones Agricolas, Buenos Aires* 6 (2), 1952 (247–62). 8 refs. [Span.] C.G.B.

Describes the occurrence of this fungus on *Chamaecyparis lawsoniana*, *Persea gratissima*, *Platanus acerifolia*, and *Eucalyptus* sp., where it caused stem and branch canker, necrosis of the root collar and decay of the roots. Morphology, behaviour of the fungus in culture, inoculation experiments and control measures are described. In infected stands it is advisable to expose the roots of only slightly infected trees by digging a ditch round the stem ca. 1·5–2 m. in diam. and 0·4–0·5 m. deep. [Cf. *F.A.* 13 No. 3115; 14 No. 2407.]

3008. JORGENSEN, E. **Note on the distribution of *Fomes annosus* (Fr.) Cke. in plantations in Ontario.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (6), 1956 (2).

The first record of *F. annosus* in Ontario was made in 1955 in a pure Red Pine plantation. Since then it has been found at two new localities and on 6 different tree species. No occurrence has yet been noted in natural stands.

3009. GOTHE, H. Beobachtungen über Stockfäule in Schlitzer Lärchenbeständen. 2. Mitteilung. [**Butt rot in Schlitz Larch stands. 2nd report.**] *Forst- u. Holzw.* 12 (5), 1957 (70–4). 13 refs. [G.g.]

Confirms the findings of the first report [see *F.A.* 15 No. 2626]. The investigations continue.

3010. BAKSHI, B. K. **Fungal diseases of Khair (*Acacia catechu* Willd.) and their prevention.** *Indian For.* 83 (1), 1957 (41–6 + 7 photos). 2 refs.

The principal diseases are heart rot caused by *Fomes badius* and root rot caused by *Ganoderma lucidum* and *Polyporus gilvus*. Khair should be grown in group mixtures with non-susceptible species.

3011. NORTON, D. C., and BEHRENS, R. ***Ganoderma zonatum* associated with dying Mesquite.** *Plant Dis. Reptr.* 40 (3), 1956 (253–4). 3 refs. A.P.B.

In 1953 *G. zonatum* was found associated with Mesquite [*Prosopis juliflora*] dying of root rot in Texas. Inoculation experiments were therefore carried out on seedlings in (1) sterile, and (2) unsterilized soils. No disease occurred on seedlings grown in (1), but 100% kill of seedlings grown in (2). The possibility is suggested of an antagonism between *G. zonatum* and other soil organisms.

3012. TOOLE, E. R., and FURNIVAL, G. M. **Progress of heartrot following fire in bottomland Red Oaks.** *J. For.* 55 (1), 1957 (20–4). 4 refs.

On the flood-plain of the Mississippi River a total of 174 trees, > 6 in. diam., of *Quercus nuttallii*, *Q. phellos*, *Q. nigra* and *Q. falcata* were examined to determine factors by which the extent of decay behind old fire scars can be assessed. A linear relationship was established between length of hollow and length of heart rot, and also between the latter and height of butt bulge. Regression equations are given for evaluating butt rot from the age and size of the scar. In addition, 66 fungi were isolated from the decayed wood, the most common being *Pleurotus ostreatus*, *Hydnum erinaceus*, *Polyporus lucidus*, *P. fissilis*, *P. zonalis* and *Odontia* spp. Rate of decay varied with the different fungi, and the mean annual rate above the scar is tabulated for 23 species. The average extent of decay is ca. 2 ft. above the top of the hollow and 3½ ft. above the butt bulge. A rule of thumb for estimating volume loss through butt rot is to reduce the merchantable length of stem by the length of rot as indicated by hollows or butt bulge, and then reduce the d.b.h.

measurement by one inch for each 6 ft. of rot. A method of predicting the probable extent of decay from recent scars is also presented.

3013. MILLER, P. W., and ROTH, L. F. **Relative susceptibility of potted seedlings of *Juglans regia*, *J. hindsii* and *Pterocarya stenoptera* to *Phytophthora cinnamomi*.** *Plant Dis. Reptr.* 40 (6), 1956 (538–41). 5 refs. A.P.B.

In greenhouse inoculation experiments, *J. regia* and *J. hindsii* proved susceptible to infection by *P. cinnamomi*, whereas *Pterocarya stenoptera* was resistant.

Wilts, Diebacks etc.

See also Nos. 2514, 3031.

3014. HOLMES, F. W. **Recorded Dutch Elm disease distribution in North America as of 1955.** *Plant Dis. Reptr.* 40 (4), 1956 (351). 4 refs. A.P.B.

3015. ROVSKIĬ, V. M. O radikaljnom metode borjby s gollandskoĭ boleznjju iljmovyh. [**A radical method of control of the Dutch Elm disease.**] *Bot. Ž.* 41 (10), 1956 (1478–81). 9 refs. [Russ.]

[Cf. *F.A.* 13 No. 272.] Discusses the extent of the damage caused by this disease and recommends the raising of hybrids resistant to it. *Ulmus pumila* var. *arborea* proved the only species completely resistant in inoculation trials.

3016. ENGELHARD, A. W. **Evaluation of salt, NaCl, as a protectant and chemotherapeutant against the Dutch Elm disease fungus in American Elm trees.** *Plant Dis. Reptr.* 40 (11), 1956 (1005–9). A.P.B.

To test the theory that Elms on saline soils are immune to Dutch Elm disease, agricultural-grade salt (NaCl) was applied in water to planted rows of American Elm at a rate of ½ lb./in. of basal stem diameter. The trees were inoculated with *Ceratostomella ulmi*, some before and some after salt application. All the inoculated trees wilted.

3017. BART, G. J. **Susceptibility of non-Oak species to *Endoconidiophora fagacearum*.** *Abstr.* in *Phytopathology* 47 (1), 1957 (3).

Of 15 species inoculated, only *Malus* developed wilt symptoms. The fungus existed with limited spread in the tissues of Ash, Beech, Dogwood, Hop-Hornbeam, Hickory, Sassafras, Sourwood and Wild Cherry but could not be recovered from Aspen, Blue Beech, Elm, Locust, Maple or Walnut.

3018. ENGELHARD, A. W., and BRAGONIER, W. H. **Dwarf-leaf, a symptom of Oak wilt.** *Abstr.* in *Phytopathology* 47 (1), 1957 (10).

A symptom of *Endoconidiophora fagacearum* infection, not hitherto mentioned as frequently characteristic in *Q. rubra* and *Q. ellipsoidalis*, is the delayed bud development and retarded leaf growth over the entire crown, with leaves decreasing in size upwards, which renders diseased trees conspicuous at leaf-flush. Further details of the colour, size, curling, drying etc. of such leaves in 30 trees in N. Iowa are given.

3019. ANDERSON, G. W., and ANDERSON, R. L. **Oak wilt—long distance spread 1955 and 1956.** *Tech. Note Lake St. For. Exp. Sta.* No. 481, 1957. pp. 1.

Over a total of 5 counties in Minnesota and Wisconsin, 315 miles of Oak were surveyed by examining strips ½ chain wide along roads. New infection centres are being established at the rate of one per 15 miles of Oak. No correlation with tree size or stand density was found.

3020. KUNTZ, J. E., and DRAKE, C. R. **Tree wounds and long distance spread of Oak wilt.** *Abstr.* in *Phytopathology* 47 (1), 1957 (22).

Inoculations of Northern Pin Oaks were successful from April through December but natural infection followed wounding usually during leaf flush and spring vessel growth. After May/June thinning of coppice, 23% of the remaining shoots, and after June pruning 19%, became infected. Wounds protected from insects were successfully surface-inoculated in all 660 Oaks up to 4 days later, but none after 8 days' interval. Natural infections occurred only within 24 hours of wounding. No wounds painted immediately after wounding became infected.

3021. STAMBAUGH, W. J., and NELSON, J. C. **Observations concerning autumn infection of Oak by *Endoconidiophora fagacearum* Bretz.** *Plant Dis. Reptr.* 40 (8), 1956 (750–1). 3 refs. A.P.B.

Comparisons of symptoms in trees artificially inoculated in September and in naturally infected trees offer strong evidence that, in addition to spring infection, autumn infection by the Oak wilt fungus also occurs in nature.

3022. ENGELHARD, A. W. **Influence of time of year and type of inoculum on infection of Oak trees inoculated with the Oak wilt fungus.** *Plant Dis. Reptr.* 40 (11), 1956 (1010–4). 9 refs. A.P.B.

Healthy Oaks were wound-inoculated at 4- to 5-week intervals from 1 February 1953 to 1 January, 1954 and on 20 May, 1954, with *Chalara quercina*. Infection of Oaks occurred only in trees inoculated within the period 25 April to the end of August. *From author's summary.*

3023. TRUE, R. P., and GILLESPIE, W. H. **Few fungus mats form on Oak wilt trees girdled to the heartwood in West Virginia.** *Plant Dis. Reptr.* 40 (3), 1956 (245–8). 15 refs. A.P.B.

Girdling (of 87 trees in W. Virginia) proved a fairly effective and highly convenient method of preventing mat formation and consequent spread of the disease; it was most successful when done in June or July.

3024. ENGELHARD, A. W. **Influence of temperature upon the development of Oak wilt fungus mats and pads in Red Oak logs in Iowa.** *Abstr.* in *Phytopathology* 47 (1), 1957 (10).

Gives the number of mats developed per sq. ft. on 34 winter-felled, 5-ft. logs, half of which were left at stump (control) and half stored at 43, 55, 69 or 90° F. The first 3 temperatures were favourable to mat formation, the last not.

3025. CURL, E. A. **Experimental transmission of *Endoconidiophora fagacearum* by Collembola.**

Plant Dis. Reptr. 40 (5), 1956 (455–8). 10 refs. A.P.B.

Wounded seedling Oaks (*Quercus virginiana*) were exposed to springtails collected from mycelial mats of *Chalara quercina*. Six out of 10 trees caged with insects from conidium-bearing mats wilted and died; 1 of 10 trees exposed to insects from mats bearing both conidia and ascopores wilted. No wilt occurred, however, when an interval of 16 hours was allowed to elapse between the time when the insects were removed from the inoculum source and when they were caged with the trees.

3026. BUCHANAN, W. D. **Preliminary tests indicate that the small Oak bark-beetle may be a vector of the Oak wilt fungus.** *Plant Dis. Reptr.* 40 (6), 1956 (654). A.P.B.

The results of inoculations of healthy trees with water containing the macerated bodies of *Pseudopityophthorus minutissimus* from diseased trees suggest that the beetle is a possible vector of Oak wilt.

3027. KADAMBI, K. **Study of *Trichosporium* disease in the Induval irrigated Casuarina plantations, Mysore state.** *Proc. 8th silv. Conf., Dehra Dun 1951*, Part 2, 1956 (332–3).

Observations of diseased trees in these plantations indicate that failure of water in irrigated plantations can of itself cause the death of trees, that drought increases the susceptibility of trees to *T. vesiculosum* attack, and that diseased trees can probably overcome an attack in its early stages if given adequate water. Recommendations are made for so applying irrigation water as to encourage deep rooting.

3028. ENGELHARD, A. W., and CARTER, J. C. **Isolations of *Verticillium albo-atrum* from woody hosts in Illinois, 1945–1955.** *Plant Dis. Reptr.* 40 (5), 1956 (459–62). 5 refs. A.P.B.

3029. WATERMAN, A. M. ***Verticillium* wilt of Yellow Poplar.** *Plant. Dis. Reptr.* 40 (4), 1956 (349–50). 4 refs. A.P.B.

Isolations from a single tree were identified as *Verticillium albo-atrum* and inoculation experiments proved the pathogenicity of this fungus to *Liriodendron tulipifera*.

3030. HOLMES, F. W. ***Verticillium* wilt of dogwood [*Cornus florida*].** *Abstr.* in *Phytopathology* 47 (1), 1957 (17).

V. albo-atrum, collected from a dying Dogwood and inoculated on American Elms, Sugar Maples and Flowering Dogwoods, was recovered from all these species, thus confirming its pathogenicity to Elm and Maple and establishing it for the Flowering Dogwood.

Cankers, Stem Rusts etc.

See also Nos. 2496, 2501–2, 2515, 2984, 3005, 3007.

3031. SARAVI CISNEROS, R. Cancrosis de los cipreses provocada por *Coryneum cardinale* Wagener en la provincia de Buenos Aires (Argentina). **[Canker of Cypresses caused by *C. cardinale* in Buenos Aires province.]** *Revista de la Facultade de Agronomía, Universidad Nacional de la Ciudad Eva Perón* 29 (1), 1953 (107–19). 10 refs. [Span.span.e.] C.G.B.

The disease in question was observed and studied on *Cupressus macrocarpa* var. *lambertiana* and notes are presented on the morphology of the fungus, other hosts (mainly *Cupressus* spp.), inoculation experiments and symptoms of the disease which, beginning as a bark canker, eventually causes wilting and die-back. Control by elimination of diseased trees accompanied by applications of Bordeaux mixture is advised.

3032. HUBER, B., and KELLER, H. Eine wenig beachtete Lärchenkrankheit (*Sclerophoma pityophila*). **[A little known Larch disease (*S. pityophila*)].** *Forstarchiv* 27 (3), 1956 (71–3). 9 refs. [G.]

Notes on the discovery of *S. pityophila* on 5- to 6-year-old *Larix decidua* in a forest near Munich, causing a bark canker similar to *Phomopsis* canker of Douglas Fir.

3033. RAWLINGS, G. B. **Australasian Cyttariaceae.** *Tech. Pap. N.Z. For. Serv.* No. 9, 1956. pp. 10 + 4 plates. 20 refs.

Describes two new species of *Cyttaria*, parasitic on *Nothofagus menziesii* in New Zealand, as *C. nigra* and *C. pallida*. *C. gunnii* is re-described and notes are given on the Australian species *C. septentrionalis*. The origin and taxonomic importance of certain anatomical features are discussed, and a table of host relations for the 10 species of *Cyttaria* and 11 species of *Nothofagus* attacked is provided. Stress is laid on gall characters in distinguishing species. Special points of interest in the New Zealand species are noted and economic considerations in connexion with *Cyttaria* in forests are enumerated. *From author's summary.*

3034. EIMERN, J. VAN. Die Witterung im Winter 1954/55 und im Frühjahr 1955 und ihre mögliche Bedeutung für den Rindentod der Pappel. **[The weather of the winter 1954–55 and spring 1955, and its possible significance in connexion with the *Dothichiza populea* epidemic.]** *Forstarchiv* 27 (2), 1956 (30–4). 4 refs. [G.g.]

A comparative analysis of the weather at Hamburg during the period. Distinctive features that may have heightened susceptibility were a mild autumn and winter, interrupted by severe frost in November, an early spring (from 10th Feb.) characterized by frequent and extreme temperature changes, and a wet late spring, favourable to fungal growth.

3035. DAVIDSON, R. W., and HINDS, T. E. **Hypoxylon canker of Aspen in Colorado.** *Plant Dis. Reptr.* 40 (2), 1956 (157–8). 6 refs. A.P.B.

Hypoxylon pruinatum on *Populus tremuloides*, reported for the first time in Colorado in 1955.

3036. TANI, T., and NAITO, N. **[On the nitrogen content of plants infected with several rust fungi.]** *Tech. Bull. Kagawa-Ken agric. Coll.* 7 (2), (Ser. No. 20), 1956 (141–3). 6 refs. [Jap.e.] A.P.B.

In a comparative study of various plants it was found that the sapwood and heartwood of Kuromatsu (*Pinus thunbergii*) infected with *Cronartium*

quercuum contained more N compounds than the healthy wood. *From authors' summary.*

Foliage Diseases

See also No. 2496.

3037. MORIONDO, F. Osservazioni sulla biologia di *Melampsora pinitorqua* Rostr. sul litorale tirrenico. **[The biology of *M. pinitorqua* on the Tyrrhenian coast.]** *Monti e Boschi* 8 (1), 1957 (31–5). [It.]

Describes an epidemic among young Pines of several species in the forest of Feniglia near Orbetello, which is attributed to their having been planted on an unsuitable site in the neighbourhood of infected Poplars.

3038. KEENER, P. D. **Two fungi associated with a microcyclic rust, *Coleosporium crowellii* Cummins, on needles of *Pinus edulis* Engelm. in Arizona.** *Madroño, Berkeley, Calif.* 13 (6), 1956 (189–95). 7 refs. E.B.

On needles of *P. edulis* collected near the south rim of the Grand Canyon, the hyperparasites *Darluca filum* and *Cladosporium aecidiicola* were found on the telial sori of the rust *Coleosporium crowellii*. The morphology of the two hyperparasites is discussed, with reference to associations recorded on other rust fungi.

3039. OECHSLIN, M. Schädigungen in Aufforstungen im Hochgebirge. **[Injuries to plantations at high altitudes.]** *Schweiz. Z. Forstw.* 108 (2), 1957 (93–101 + 1 plate). [G.f.]

The chief injurious agents discussed are: (1) *Herpotrichia nigra*—Chemical control, because of weather conditions, is likely to be successful in the nursery only, and even there only if applied before the first snow. In the field, covering the ground round the plants with stones, or with cut grass, has helped. (2) Moving snow.—Planting closely in strips below natural or artificial shelter (clusters of stakes) is chiefly recommended.

3040. THOMPSON, G. E. **A rust disease of the Smoke-tree new to North America.** *Plant Dis. Reptr.* 40 (11), 1956 (1015–6). A.P.B.

A rust observed on *Rhus cotinus* at the University of Georgia, Athens, is tenatively ascribed to *Pileolaria cotini-coggyriae*.

3041. CREELMAN, D. W. **The occurrence of Ash rust in western Nova Scotia.** *Plant Dis. Reptr.* 40 (6), 1956 (580). 3 refs. A.P.B.

Severe and widespread damage to *Fraxinus americana* has been caused annually since 1951 by *Puccinia sparganioides* in western Nova Scotia. Previous to this, occurrence of the disease had been only sporadic. Short notes are presented on the outbreak and on alternate hosts.

3042. BUDDENHAGEN, I. W., and YOUNG, R. A. **A leaf and twig disease of English Holly caused by *Phytophthora ilicis* n. sp.** *Phytopathology* 47 (2), 1957 (95–101). 18 refs.

Describes and illustrates the important pathogen and its symptoms [cf. *F.A.* 16 No. 3152]. Characters separating it from other low-temperature *Phytophthora* spp. are noted.

3043. MILLER, P. W. **Preliminary comparison of Agrimycin 100 and copper compounds for the control of [bacterial] Walnut blight [*Xanthomonas juglandis*] in Oregon.** *Plant Dis. Reptr.* 40 (7), 1956 (626–7). 7 refs. A.P.B.

In field tests carried out in 1954 and 1955, Agrimycin 100 (a powder formulation containing 15% streptomycin sulphate and 1·5% Terramycin) was as effective as yellow Cuprocide (2 lb. to 100 gal.), and Agri-mycin 100 at the rate of 25 p.p.m. gave nearly as good results as Copper A Compound (4 lb. to 100 gal.) on a mild infection. No foliage injury was caused.

444. Virus Diseases

3044. SMITH, K. M. **A textbook of plant virus diseases.** J. A. Churchill Ltd., London. 2nd ed. 1957. pp. 652. 33 pp. of refs. Price £3. 5*s*.

Revised ed. of a book first published in 1937. Over 300 viruses are dealt with.

3045. BLATTNÝ, C. Poznámky o virose smrku. Předběžné sdělení. **[Notes on a virus disease of *Picea abies*. Preliminary report.]** *Sborn. čsl. Akad. zeměd. (Lesn.)* 29 (10), 1956 (771–4). [Cz.Russ. E.]

The author, referring to his communications in *Ochrana Rostlin* (in 1939 and 1950), and to that of Smolak in *Lesn. Práce* (1948), concerning a disease characterized by a yellow-white discoloration of Spruce needles, reports on tests instituted by him in 1953 and 1954 to determine whether it was a virus disease. Grafting tests have so far proved inconclusive; it was found, however, that fewer scions from diseased than from healthy trees formed successful unions. Further tests were made using the aphid *Sacchiphantes* (*Chermes*) *abietis* as a virus carrier; in 20% of cases the disease was definitely transferred. The proteins of diseased stems were found to differ in serological and electrophoretical properties from those in sound stems.

3046. CALLAHAN, K. L. **Pollen transmission of Elm mosaic virus.** *Abstr.* in *Phytopathology* 47 (1), 1957 (5).

Seed-transmitted virus was found in 1954 in the pollen of an infected tree. Four combinations of healthy (*h*) and infected (*i*) pistils (*F*) and pollen (*M*) resulted in 2432 seedlings; of 336 from $hF \times hM$ none was infected; of 569 from $iF \times iM$, 48% were infected; of 1523 from $hF \times iM$, 30·5% were infected; of 4 seedlings from $iF \times hM$ 3 were infected. The virus is therefore concluded to be pollen-transmitted.

45. Damage by Animals

451. Mammals

See also Nos. 2460, 2783–4, 2824, 2974.

3047. MCNALLY, J. **Damage to Victorian exotic Pine plantations by native animals.** *Aust. For.* 19 (2), 1955 (87–99). 13 refs.

Serious damage to exotic Pine (mainly *Pinus radiata*) plantations is being caused by two species of possum, the black-tailed wallaby, and the allied rat. Damage consists of bark-stripping and girdling or partial girdling. Ecological factors and possible methods of control are discussed. [Cf. *F.A.* 18 No. 1819.]

3048. SCHINDLER, U. Erfahrungen der Praxis bei der Erdmausbekämpfung mit Toxaphen und Endrin. **[Results of field control measures with toxaphene and endrin against *Microtus agrestis*.]** *Forst- u. Holzw.* 12 (3), 1957 (33–8). 10 refs. [G.g.]

Large-scale tests on regeneration areas (both fenced and unfenced) in Lower Saxony confirmed earlier findings [cf. *F.A.* 17 No. 4123] and showed that dosages could be lowered, particularly if the grass was mown, to 4–5 kg. of toxaphene and 1–1·2 kg. of endrin/ha. Knapsack sprayers with atomizing sprays proved the most economical.

3049. MEANLEY, B., and BLAIR, R. M. **Damage to Longleaf Pine seedlings by cotton rats.** *J. For.* 55 (1), 1957 (35).

A heavy infestation of *Sigmodon hispidus* was discovered in May 1956 in a 400-acre stand of *P. palustris* near Oakdale, La. The seedlings were 18–30 months old; those $< \frac{1}{3}$ in. in diam. were bitten off at or below the ground line, and larger seedlings were girdled for $\frac{1}{3}$–$\frac{1}{2}$ of their circumference. Shallow digging was noted round many of the injured seedlings and some of the girdles clearly showed rodent tooth marks. An average of 10% of the seedlings were killed or seriously injured, but the infestation was not uniform over the whole area. No attacks were noted on × *P. sondereggeri* or an adjacent plantation of *P. elliottii*, but occasional attacks were reported on *P. taeda*. Brush piles and bluestem grass made the habitat suitable for the rat. If the infestation is discovered in autumn or winter, prescribed burning offers best control; at other seasons poisoned baits can be used.

3050. GLOVER, F. A. **Black bear damage to Redwood reproduction.** *J. Wildlife Mgmt.* 19 (4), 1955 (437–43). B.A.P.

[Cf. *F.A.* 13 No. 2279.] Stripping of bark from Redwood in Humboldt County, California, is attributed to the black bear (*Euarctos americanus*). A survey of the damage showed that it tended to be most severe on second-growth trees 10–30 years old, but there were indications of increasing damage to trees in the 5- to 10-year age class. The number of damaged trees per acre ranged from 8 to 15. The peak year of injury was 1950; 1951 and 1952 showed a slight decrease. Time of activity was spring and summer.

3051. NEILS, G., ADAMS, L., and BLAIR, R. M. **Management of white-tailed deer and Ponderosa Pine.** *Trans. N. Amer. Wildlife Conf.* 20, 1955 (539–51). 35 refs. B.A.P.

Experimental deer-exclusion studies showed that deer are effectively preventing the regeneration of Ponderosa in western Montana. A survey of winter deer range also showed that an increase in Douglas Fir is favoured by the deer's preference for Ponderosa. The problem of limiting the number of deer is discussed.

3052. BAADER, G. Die Wildschäden in Rheinland-Pfalz und Vorschläge für ihre Verminderung. **[Game damage in Rhineland-Palatinate and proposals for reducing it.]** *Allg. Forst- u. Jagdztg.* 127 (10; 11/12), 1956 (190–212; 233–40). 17 refs. [G.e.]

The first part of the paper, based on a survey made for the state authorities, involving a questionnaire to 117 forest districts (729,658 ha.), presents data on damage by browsing, bark-scaling etc., for state and corporation forests, by species (Spruce, Pine and Beech), and by age, diameter, and crown classes. It is almost exclusively concerned with red deer, which is a problem in 74 of the districts, though population figures vary considerably and are deemed unreliable: an estimate for 1952 was ca. 9000, while one for 1954, on a different basis, was about half this figure. Three degrees of scaling are distinguished, computations of loss of value of growing stock and loss of increment are tabulated, and methods of computation discussed. Damage to plantations and costs of protection are also dealt with. In many areas the high cost of fencing etc. excludes or restricts the use of silviculturally suitable species (hardwoods, Silver Fir, Douglas Fir, etc.); the possible losses to forestry from this cause cannot be estimated. The annual loss of revenue through bark-scaling of Spruce is put at over one million DM. for state forests alone, and the capital loss of state and corporation forests together at 50 million. By comparison, the revenue from the game management and the sale of shooting rights is negligible. Protective measures, repellents, and provision of more food for the deer are discussed, but the only effective remedy is seen in a drastic reduction of numbers and the segregation of the deer. A figure of one head/100 ha. of forest for ca. 80,000 ha. of game reserves, and one head/200 ha. for a further 80,000 ha. of border areas is considered the tolerable limit.

The second part reports on more detailed sample surveys of individual stands in 7 districts and the methods used for evaluating scaling damage. It is concluded that the total figures of the survey are serious underestimates, both as to the extent of damaged stands and the gravity of damage. Existing game laws are criticized, and the reduction of red deer envisaged by the State Government ordinance viz., 1·5 head/600 ha. and 0·75 head/600 ha. of shoot, not of forest, in game reserves and border areas respectively, is considered inadequate.

3053. WODSAK, W., and UECKERMANN, E. Die Vitamingehalte der wichtigsten Baumrinden und deren möglicher Einfluss auf das Schälen des Rotwilds. **[Vitamin contents of the bark of the principal forest trees, and their possible influence on bark-scaling by red deer.]** *Internationale Zeitschrift für Vitaminforschung, Bern and Stuttgart* 25 (4), 1955 (379–84). 5 refs. [G.e.f.] E.U.

Presents tables of vitamin contents in spring and autumn of bark from young trees of Oak, Larch, Birch, Beech, Pine, Spruce, Ash and (spring only)

Alder and Lime. Values varied considerably between species and seasons, but no relation was found between vitamin content and preference by deer. Experiments with special licks containing vitamins or trace elements have so far been negative.

3054. VOLKERT. Untersuchungen über den Einfluss des Rotwildschälens auf die Holzeigenschaften der Rotbuche. **[The effect of bark-scaling by deer on the timber properties of Beech.]** *Forsch. u. Berat. (Forstw.) Landesaussch. landw. Forsch. Landes Nordrhein-Westfalen* No. 2, 1956 (101–5). [G.]

Summarizes results of investigations on 48 stems from two 34-year stands near Hann. Münden, which had been repeatedly scaled. Size of wound was related to tree girth, varying between 1 and 30 cm. in width and from 4 to 91% of the girth, though wounds > 50% of the girth or > 16 cm. wide numbered < 20%. Callus on wounds > 10 cm. wide developed at the rate of ca. 0·5 cm. p.a. on each side on dominant trees (more slowly on the lower crown classes). The resulting discoloration never exceeded the width of the wound laterally. In wounds < 5 cm. wide formation of protection wood always prevented fungal infection and limited discoloration to a narrow layer. In wider wounds radial discoloration caused by fungal infection penetrated for several centimetres. It is concluded that in young stands damage is small and should neither influence selection for thinning, nor justify control measures. In older stands, control is considered essential.

3055. GERLING, J. Schädliche Wirkung von Fegeschutzmanschetten? **[Injury caused by the use of jackets to protect trees against rubbing by deer?]** *Forst- u. Holzw.* 12 (6), 1957 (104). [G.]

Many young trees of *Acer platanoides* fitted with jackets of roofing felt lost their leaves. On inspection, they showed serious bark injuries, due to overheating inside the jacket in direct sunshine.

3056. SOMMER, H. G. Waldbau durch Zaunschutz. **[Fencing in silviculture.]** *Forstwiss. Forsch.* No. 7, 1956. pp. 64. 72 refs. [G.g.]

Discusses, with illustrations, including analyses of ground vegetation and soil fauna, the effect of fencing on regeneration, plantations, young stands etc., types of fences (permanent or movable, wood or wire), gates, and stiles, their siting, erection, preservation, maintenance, costs, and economic justification.

3057. GUSOVIUS, O. Wildgatter. **[Game fences.]** *Forstarchiv* 26 (12), 1955 (295–6). [G.]

Gives data for W. Germany on the efficiency and costs of fencing as a protection against game.

453. Insects

See also Nos. 2959, 3025–6.

3058. ČAPEK, M., CHARVÁT, K., and PATOČKA, J. Zur Problematik der forstlichen Entomologie in der Slowakei. **[Problems of forest entomology in Slovakia.]** *Anz. Schädlingsk.* 30 (2), 1957 (17–23). 71 refs. [G.]

Reviews the most important outbreaks since World War II and control measures against pests of Spruce, Silver Fir, Douglas Fir, Oak, hybrid Black Poplar and Ash.

3059. KUDLER, J., PIVETZ, B., and JANČAŘÍK, V. Stav hlavních lesních škůdců a chorob v českých zemích a předpověď na rok 1956. **[Status of the main forests pests and diseases in the Czech provinces, and a forecast for 1956.]** *Lesn. Práce* 35 (3), 1956 (100–5). [Cz.]

Describes the position with regard to: *Ips typographus*, *Pityogenes chalcographus*, *Polygraphus polygraphus*, *Xyloterus lineatus*, *Lymantria monacha*, *Pachynematus scutellatus*, *Lygaeonematus abietinus*, *Cephaleia abietis*, *Bupalus piniarius*, *Tortrix viridana*, *Lymantria dispar*, *Armillaria mellea*, and *Phytophthora fagi*.

3060. BAKKE, A. Skadeinsekter på skogen i 1955 og 1956. **[Insect pests in [Norwegian] forests in 1955 and 1956.]** *Norsk Skogbr.* 3 (5), 1957 (129–32). [Nor.e.]

Reviews insects attacking Norway Spruce, Scots Pine, *Larix sibirica*, Oak and Birch.

3061. BECKWITH, L. C., and ANDERSON, R. L. **The forest insect and disease situation, Lake States, 1956.** *Sta. Pap. Lake St. For. Exp. Sta.* No. 42, 1956. pp. 26.

3062. TRIPP, H. A., and HEDLIN, A. F. **An ecological study and damage appraisal of White Spruce cone insects.** *For. Chron.* 32 (4), 1956 (400–10). 10 refs.

Discusses insects that inhabit the cones of *Picea glauca* in Ontario and Saskatchewan. Insects that spend their entire developmental stages within the cone and cause appreciable damage are discussed at greater length. In Ontario these are *Laspeyresia youngana* and *Pegohylemyia anthracina*; in Saskatchewan *L. youngana* is the principal pest. Other insects, of less importance for seed production, are gall midges and casual cone feeders. *From authors' summary.*

3063. STEVENS, R. E. **Insect-caused damage to the 1956 Douglas Fir cone crop in California.** *For. Res. Note Calif. For. Range Exp. Sta.* No. 120, 1957. pp. 2.

Cone samples were collected from 8 Douglas Fir sites in August 1956. Examination after 4 months showed insect damage to be negligible; 16·5% of the cones were infested with cone moths and 0·4% of the seeds were destroyed by seed chalcids.

3064. BECKER, G. Grundzüge der Insektensuccession in *Pinus*-Arten der Gebirge von Guatemala. **[The succession of insects on *Pinus* species in the mountains of Guatemala.** *Z. angew. Ent.* 37 (1), 1955 (1–28). 45 refs. [G.g.] O.H.

Lists 110 species found on 6 species of Pine, mostly above 2000 m. alt. Three successional stages are distinguished: trees (and stumps) still green, trees with wood still largely sound and bark loose, and rotting trees.

3065. BAZZIGHER, G., FISCHER, F., and MARTIGNONI, M. E. Dégâts causés aux peupliers par des

insectes et des champignons. **[Damage to Poplars by insects and fungi.]** *Forêt, Neuchâtel* 10 (6), 1957 (130–40). [F.]

Discusses the hazards inherent in monoclonal or nearly monoclonal plantations, describes the appearance and control of the more serious pests and diseases, and gives instructions for reporting, to the Swiss Forest Research Institute, observations on *Sciapteron tabaniforme*, *Gypsonoma aceriana*, *G. neglectana*, *G. oppressana*, *Hyphantria cunea*, *Saperda carcharias*, *S. populnea*, and diseases of stem, leaves and roots.

Insects: Natural and Biological Control

See also Nos. 3079–81, 3086, 3093–4, 3097, 3101, 3103, 3139, 3143.

3066. THALENHORST, W. Biologischer Forstschutz: Therapie und Hygiene. Sammelreferat über die wichtigsten forstpathologischen Arbeiten der Jahre 1943–1954. V. **[Biological forest protection: therapy and hygiene. A review of the most important works in forest pathology from 1943 to 1954. V.]** *Forstarchiv* 27 (10), 1956 (217–26). 146 refs. [G.]

[Cf. *F.A.* 18 No. 1832.] The biological control of pathogenic organisms is considered with particular reference to the usefulness of the red ant and other predatory insects, parasitic insects, birds, bats and wild boar.

3067. WEISER, J. Protozoäre Infektionen im Kampfe gegen Insekten. **[Protozoal infection in the control of insects.]** *Z. PflKrankh.* 63 (11), 1956 (625–38). 17 refs. [G.e.] E.M.B.

A survey, including data on the control with microsporidia of *Hyphantria cunea* [cf. *F.A.* 17 No. 4182], *Lymantria dispar*, and *Malacosoma neustria*.

Insects: Chemical Control (General)

See also Nos. 2949–51, 3073–4, 3076–7, 3089, 3091, 3095, 3107, 3109, 3115–6, 3119.

3068. KERSWILL, C. J., and ELSON, P. F. **Preliminary observations on effects of 1954 DDT spraying on Miramichi salmon stocks.** *Progress Report of the Atlantic Coast Station, Ottawa* No. 62, 1955 (17–24). [E.f.] B.A.P.

In June 1954 about one-third of the watershed of the Miramichi River was sprayed as part of a campaign against Spruce budworm. Since a survey was begun in 1950 of young salmon in and entering tributaries of the Miramichi River, some valuable comparisons could be made. The effects of spraying were also noted on young salmon held in cages in the Miramichi River. It is evident that spraying has seriously harmed the salmon. Not only were numbers of young salmon greatly reduced, but their food supply also was badly affected. The spray consisted of DDT diluted with solvent to give ½ lb./acre.

3069. WELLENSTEIN, G. Neue Erfahrungen mit arsenfreien Frassgiften in der Forstschädlingsbekämpfung. **[Recent experiences with As-free stomach poisons in forest pest control.]** *Verhandlungen der deutschen Gesellschaft für angewandte Entomologie E.V., Frankfurt a.M. 1952*, 1954 (148–56). 11 refs. [G.] I.I.E.

Stresses the need for protecting harmless and useful forest insects against the effects of indiscriminate contact poisons like DDT and BHC and gives data from field and laboratory observations on chlorinated nitro-carbazole preparations, e.g. Hö. 2584 and Dicarzol Ultra, acting chiefly as stomach poisons, in lethal and sublethal doses [cf. *F.A.* 15 No. 447]. They showed good test results against *Dasychira pudibunda*, *Sphinx pinastri*, *Hylobius abietis* and barkbeetles; 1·5–3 kg./ha. is considered an effective dosage for forest application. In field tests in the Palatinate, sprays of Hö. 2584 in 0·5% aqueous solution were effective against *Melolontha*, the effect being more rapid in warm weather. They were also effective, by helicopter, against *Agrilus viridis*. Another preparation discussed is thiodiphenylamine (Phenothiacine) which, admittedly in higher concentration (1%), proved superior to the nitro-carbazoles in tests with *D. pudibunda*. So far its one drawback is instability in light. Both types of insecticide proved harmless to bees when fed in normal concentrations.

3070. UNTERSTENHÖFER, G. Dipterex, ein neues, ungiftiges Insektizid. **[Dipterex, a new non-poisonous insecticide.]** *Anz. Schädlingsk.* 30 (1), 1957 (7–10). [G.g.]

Presents the results of tests of Dipterex, a new German insecticide based on dimethylhydroxy-trichloroethyl-phosphonate, against a large variety of insects. The preparation is harmless to plants and only mildly toxic to bees.

3071. CORY, E. N., and HIGHLAND, H. A. **Control of some pests of ornamentals.** *J. econ. Ent.* 50 (1), 1957 (86–9). 8 refs.

Includes data on the successful control of *Psylla buxi* with malathion spray, and of *Monarthropalpus buxi* and *Phytomyza ilicis* with a Systox [E 1049] foliage or soil drench, and Systox or Schradan soil drench respectively.

3072. MATTHYSSE, J. G. **Elm leaf beetle and Dutch Elm disease—experiments on practical use of mist blowers in New York State.** *Trees, Ohio* 17 (2), 1957 (7–8, 16, 18–9).

Gives particulars of formulations, concentrations, dosages, time per tree, season, choice of nozzle etc. for mist-spraying of Elms against the leaf beetle and vectors of Dutch Elm disease. DDT and dieldrin are chiefly used.

Isoptera

See also No. 2448.

3073. SCHMITZ, G. Les termites et les moyens de les détruire. **[Termites and methods for their destruction.]** *Bull. agric. Congo belge* 47 (6), 1956 (1551–96). 74 refs. [F.flem.]

Covers the mechanical and chemical destruction of termitaria (D-D, aldrin, parathion); prevention in the soil, seed, cuttings and established plants (dieldrin, aldrin, chlordane, parathion); the protection of buildings; timber; and packaging.

3074. **Control measures against insects attacks on trees.** *Rep. For. Adm. Malaya 1955*, 1956 (18).

Mortality from termite attack on the roots of young trees of *Eucalyptus* spp. was reduced from 15 to 2% by applications of dieldrin to the soil. D-D soil fumigant killed the trees as well as the termites. Dieldrin also eradicated carton-building ants (*Crematogaster* spp.) from young trees.

Thysanoptera

3075. VITÉ, J. P. Populationsstudien am Lärchenblasenfuss *Taeniothrips laricivorus* Krat. [**Population studies on *T. laricivorus*.**] *Z. angew. Ent.* 38 (4), 1956 (417–48). 42 refs. [G.g.] O.H.

Reports studies on Larch thrips, chiefly in the Kattenbühl instructional forest near Hann. Münden and in the N.E. Alps, near Lunz, Lower Austria, dealing in particular with the following: (*a*) Hibernation on Spruce—Spruces in the vicinity, even if not quite close, were greatly preferred to other species, Sitka being slightly more favoured than Norway. (*b*) Life history, migration from other hosts, distribution over other more distant Larches, distribution within trees, swarming etc. Trees which, after attack, developed a bushy habit harboured more thrips than those which retained their normal form. In all localities investigated, even in the Alps, two generations were found, one swarming and ovipositing in early, and the other in late summer. The later development of the second generation in the Alps (4–5 weeks later than in Hann. Münden) is one of the factors that prevents their causing equally heavy injuries. Very heavy exposure to wind prevents the thrips from colonizing a tree.

3076. VITÉ, J. P. Über einige Versuche zur Bekämpfung des Lärchenblasenfusses durch Baumimpfung. [**Experiments in the control of *Taeniothrips laricivorus* by tree injection.**] *Schweiz. Z. Forstw.* 108 (2), 1957 (81–92). 11 refs. [G.f.]

Describes the application of Metasystox to Larch (1) by bands of absorbent cotton [cf. *F.A.* 18 No. 629], (2) using cartridges (*a*) 25 mm., (*b*) 9 mm. in diam., with toothed edges which are knocked into the tree either through the smoothed bark, or after removal of a corresponding disk of bark, and (3) by a hollow, doubled-edged knife, 20–25 mm. long, with distal holes stabbed into the tree with the blade parallel to its axis. (1) requires careful timing and is expensive of time and poison. The poison spreads by slow diffusion throughout the crown in reduced concentration. It is recommended for young trees and particularly against *Coleophora laricella*. If bands are left > 1 year for repeated applications, swellings occur on the stems. (2) gave good control of *T. laricivorus* with comparatively small amounts of poison (5–35 c.c.) in concentrations of 25–66%. This was carried to the top in a concentrated stream from the point of application, but general spread (important against *C. laricella*) was less good. If the cartridges were left for some weeks, injuries to the cambium could be observed, though no fungal attack. Method (3) combined quick working and small poison requirements per tree with rapid spread of the poison to the top and all round the crown by spiral paths in the xylem, as revealed by dyes. It is considered the most promising method for the combined control of both pests. No details on success and dosages are, however, yet available.

Hemiptera

See also Nos. 3045, 3071.

3077. KRUEL, W. Neuere Untersuchungen aus dem Institut für Waldschutz zum Auftreten und zur Bekämpfung der Douglasienwollaus, *Gilletteella cooleyi* (Gill.) C. B. (Adelgidae), im Gebiete der DDR. [**Recent work by the Section for Forest Protection [Eberswalde] on the occurrence and control of *Adelges cooleyi* in E. Germany.**] *Verhandlungen der deutschen Gesellschaft für angewandte Entomologie E.V., Frankfurt a.M. 1952*, 1954 (41–9). 7 refs. [G.] I.I.E.

The pest is widespread. Strains of Douglas resistant to *Rhabdocline* are frequently heavily infested, and vice versa. DDT, BHC, H_3PO_4 ester and nicotine preparations in aqueous solutions applied as sprays were about equally effective against winter sistentes, which were killed in ca. 3 days. Nicotine killed woolly stages in 10–12 days.

3078. KLOFT, W. Untersuchungen an der Rinde von Weisstannen (*Abies pectinata*) bei Befall durch *Dreyfusia* (*Adelges*) *piceae* Ratz. [**Studies on the bark of *Abies alba* infested by *Adelges piceae*.**] *Z. angew. Ent.* 37 (3), 1955 (340–8). 14 refs. [G.e.] O.H.

Changes in the inner bark of 80-year-old trees infested to varying degrees were investigated by specific cytochemical methods. The cells on which the aphids feed (phellogen, phelloderm, the parenchyma of the medullary rays and annular layers, the neighbourhood of resin ducts and lenticels are favoured spots) are emptied of their proteins and polysaccharides, and after some time collapse completely. As a result of 2–3 years' feeding, all parenchymatous tissues to a depth of 3–4 mm. collapse, causing pathological bark formation. This drying up of the food supply usually leads to collapse of the mass infestation without serious injury to the tree. The different reaction of the bark of *A. balsamea* which may account for the much greater seriousness of attacks, is discussed. *From author's summary.*

3079. DELUCCHI, V., and PSCHORN-WALCHER, H. Les espèces du genre *Cnemodon* Egger (*Diptera, Syrphidae*) prédatrices de *Dreyfusia* (*Adelges*) *piceae* Ratzeburg (Hemiptera, Adelgidae). Part I. [**Species of *Cnemodon* preying on *Adelges piceae*. Part I.**] *Z. angew. Ent.* 37 (4), 1955 (492–6). 16 refs. [F.g.] O.H.

Part I is a systematic revision of the genus. A new species, *Cnemodon dreyfusiae* is described. It is a frequent predator of *Adelges piceae*.

3080. **[Biological control of scale insects.]** *Rep. Dep. Agric. Seychelles 1955*, 1956 (14).

A heavy infestation of an unidentified scale insect in a plantation of *Cedrela odorata* was naturally controlled by an indigenous coccinellid which bred rapidly, the larvae occurring in large

tightly packed clusters. Specimens of *C. mexicana* 1½ miles from the original attack were later found to be infested with the scale, and adult Coccinellidae were transferred to them to breed.

3081. SCHMUTTERER, H. Ergebnisse von Zehrwespenzuchten aus Schildläusen (2. Teil). [**Breeding Chalcididae from Coccidae (Part 2).**] *Beiträge zur Entomologie, Berlin* 5 (5/6), 1955 (510–21). 14 refs. [G.g.] I.I.E.

[Cf. *F.A.* 17 No. 4155.] Lists a further 31 chalcids, some bred from parasites of forest trees.

3082. SCHÖNHERR, J. Erfahrungen bei der Bekämpfung von Eschenbastkäfer und Eschennapfschildlaus. [**The control of Ash barkbeetles and coccids.**] *Forst u. Jagd* 5 (2), 1955 (56–60). 7 refs. [G.]

Includes a discussion of the biology, life cycle, habitat, enemies etc. of these secondary pests, and of the reasons for the reduced vigour of Ash in the Elbe bottomland forests, which has led to their serious increase. The control of the coccids, chiefly *Lecanium corni*, is difficult owing to the height of the trees, and because of the dangers of the indiscriminate use of fog sprays. Silvicultural measures, including clearing the ground of Ash debris, are considered slightly more hopeful. Of various types of trap logs tried for the barkbeetles *Hylesinus fraxini* and *H. crenatus*, short split pieces autumn- or winter-cut, either in loose cross-stacks or pyramids were best. For their disinfestation, treatment in portable steam-pressure chambers and spraying with Silvexol [BHC?] (ca. 0·5 litres/sq. m. surface) proved successful.

3083. BEAN, J. L. **Red Pine scale [*Matsucoccus resinosae*].** *For. Pest Leafl. U.S. For. Serv.* No. 10, 1956. pp. 4. 2 refs.

The scale insect is found so far only in Connecticut and Long Island and attacks *Pinus resinosa*. Its life history is described [cf. *F.A.* 17 No. 606]. Attempts to establish it on other Pines have failed, but it has recently been found on *P. densiflora* and *P. tabulaeformis*.

3084. PELED, N. **Control of the Israel Pine *Matsucoccus* by early pruning.** *La-Yaaran* 7 (1/2), 1957 (7–10, 26–25). [Heb.e.]

This pest, a potential danger for all Pines between the 4th and 6th years, but attacking Aleppo Pine most heavily, prefers moist shade and an even temperature. In a comparison of trees (*a*) pruned before infestation, (*b*) pruned after infestation and (*c*) infested and left unpruned, (*a*) were not attacked but 60% of (*c*) were dead. In (*b*) the disease disappeared gradually in 3 years. Pruning in the 5th and 10th year is recommended. It is cheaper than one pruning at 10 years.

3085. SCHMUTTERER, H. Ergebnisse neuerer Untersuchungen über die Fichtenquirl-Schildlaus *Physokermes piceae* (Schrk.). [**Recent investigations on *P. piceae*.**] *Verhandlungen der deutschen Gesellschaft für angewandte Entomologie E.V., Frankfurt a.M. 1952*, 1954 (168–74). 8 refs. [G.] I.I.E.

A discussion of its morphology, development, hosts, symbionts and enemies, and the effect of climatic and site conditions on population fluctuations. Its importance as a provider of honey-dew for bees is considered great, its effect on Spruce not serious. [Cf. *F.A.* 18 No. 2894.]

Lepidoptera

See also Nos. 2619, 2667, 2715, 3062–3, 3067–9, 3076, 3111.

3086. MILLER, W. E. **Notes on the life cycles of three parasites of the pitch twigmoth [*Petrova comstockiana*].** *Ohio J. Sci.* 55 (5), 1955 (317–9). 4 refs. C.G.B.

Agathis pini, *Perilampus fulvicornis* and *Hyssopus thymus*.

3087. **The Pine shoot moth and related species.** *Leafl. For. Comm., Lond.* No. 40, 1956. pp. 8. Price 9*d*.

Describes the main features of the life cycles and forest importance of *Evetria* (*Rhyacionia*) *buoliana*, *E. turionana*, *E. resinella* and *E. purdeyi*.

3088. **The European Pine shoot moth [*Rhyacionia buoliana*] in Ontario.** *Publ. Dep. Agric. Can.* No. 1000, 1957. pp. 2.

3089. MOROFSKY, W. F., GUYER, G. E., and LEMMIEN, W. **Chemical control of the European Pine shoot moth [*Rhyacionia buoliana*] in southwestern Michigan.** *Quart. Bull. Mich. agric. Exp. Sta.* 39 (2), 1956 (236–40). 1 ref.

A preliminary report of a study of *R. buoliana* on Red Pine and control measures against it. Data were collected and tabulated for 15 counties in Michigan, on the date of emergence and length of emergence period of adult moths. Control measures were carried out on ca. 18 acres of Red Pine in June 1955, using concentrations per 100 gal. of water of (*a*) 3 lb. and (*b*) 6 lb. DDT (50% wettable powder), (*c*) 3 lb. DDT (50% w.p.) + 3 lb. lindane (γ BHC, 25% w.p.), (*d*) 8 lb. DDT (5% dust), (*e*) 1½ pints endrin (19·5% emulsion), (*f*) 2 lb. Diazinon (25% w.p.), (*g*) 1 gal.Thimet (48% emulsion). Methods used were hand and power spraying and dusting; spraying was done to the point of run-off. Costs of treating Red Pine 4 ft. high are stated for all 3 methods. DDT or combinations of DDT and lindane proved most effective; spraying was more satisfactory than dusting, and power sprayers were more efficient than hand sprayers on trees > 4 ft. high.

3090. KAELIN, A., and AUER, C. Statistische Methoden zur Untersuchung von Insektenpopulationen dargestellt am Beispiel des grauen Lärchenwicklers (*Eucosma griseana* Hb. = *Semasia diniana* Gn.). [**Statistical methods for the investigation of insect populations, exemplified on *E. griseana*.**] *Z. angew. Ent.* 36 (3–4), 1954 (24–83; 423–61). 7 refs. [G.g.] O.H.

Describes their application to the periodic outbreaks in the Engadine, discussing principles and factors considered in selecting sample areas and trees, criteria for evaluation of results, methods for

dealing with ecological factors of great complexity, such as altitude, aspect, composition of stands, soil cover, etc., and plans for the following year.

3091. MAKSYMOV, J. K., and AUER, C. Versuch zur Bekämpfung des grauen Lärchenwicklers (*Eucosma griseana* Hb. = *Semasia diniana* Gn.) mit einer DDT—Gamma-Lösung im Nebelverfahren. **[Control experiments on *E. griseana* with a DDT/γBHC solution by a fogging method.]** *Z. angew. Ent.* 37 (4), 1955 (472–91). 5 refs. [G.g.] O.H.

Reports on an experiment in which the insecticide was applied by a portable 'swingfog' type of apparatus [cf. *F.A.* 18 No. 1887] to a small stand in the upper Engadine in mid-June, when most larvae were in their 3rd instar. Methods of evaluation, based on sample counts distinguishing ecological position, part of stand and part of crown, and collection of sheets, are discussed. Though weather conditions were not very suitable for the fog to reach the tops of the trees and remain there, the % of kills varied between 77 and 96 according to part of crown and position in the stand. Of nearly 40,000 specimens caught on the sheets, only ca. 30% were *E. griseana* larvae, and of these 58% were parasitized. In view of the unknown effects of such drastic disturbances of the biocoenosis, which might well be adverse, the use of chemical control on a large scale is not recommended.

3092. BEAN, J. L., and GRAEBER, H. **Spruce budworm increasing in Minnesota.** *Tech. Note Lake St. For. Exp. Sta.* No. 479, 1957. pp. 2.

Larval collections of *Choristoneura fumiferana* from 97 plots in N. Minnesota showed an increase from 12 larvae in 1955 to 59 larvae in 1956 [? per plot]. Defoliation was observed over 419,000 acres of Spruce/Fir stands, most of the Balsam Fir having lost ⩾ 30% of their foliage. An increase in the extent and severity of defoliation is to be expected for 1957. Further research on methods of biological control is needed.

3093. NEILSON, M. M. **Disease in Spruce budworm adults.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (6), 1956 (1–2).

A study of adults emerging (*a*) from field-gathered and (*b*) from laboratory-reared pupae, showed a much higher incidence of infection with microsporidia in (*a*). Disease in adults may explain decreases in population not otherwise explicable on the basis of present knowledge.

3094. THOMSON, H. M. ***Perezia fumiferanae* n. sp., a new species of Microsporidia from the Spruce budworm, *Choristoneura fumiferana* (Clem.).** *Journal of Parasitology, Lancaster, Pa.* 41 (4), 1955 (416–23). 8 refs. B.A.P.

Notes on its life cycle and effects on the host.

3095. WHITESIDE, J. M. **Spruce budworm [*Choristoneura fumiferana*] control in Oregon and Washington 1949–1956.** Pacific Northwest Forest and Range Experiment Station, Portland, Ore. 1956. pp. ii + 23 + 1 gph. + 1 map. 19 refs.

3096. MORRIS, R. F., WEBB, F. E., and BENNETT, C. W. **A method of phenological survey for use in forest insect studies.** *Repr.* from *Canad. J. Zool.* 34 (6), 1956 (533–40). 6 refs.

Developed in northern New Brunswick to assist the timing of population sampling of the Spruce budworm [cf. *F.A.* 17 No. 1768], but useful also for the timing of aerial spraying, the method is based on the time and rate of shoot elongation of *Abies balsamea* or (a convenient substitute where its shoots have been damaged by budworm) *Prunus pennsylvanica*. Terminal shoots of primary branches were generally selected on 5 or more trees at each station. At 'reference' stations (laboratory and field stations manned throughout the season) measurements were weekly, but at 'survey' stations, scattered over the watersheds under study, only twice, i.e. early in the season, when cumulative shoot growth was ca. 25% of average total growth, and after growth had been completed. Differences between reference stations, as shown on curves plotting cumulative growth % against time, are compared and discussed. A comparison of inter- and intra-tree variances in % of cumulative growth showed the former to be much the greater. For Balsam the selection of one shoot per tree and 10 or more trees per station is recommended; with Cherry the variance is greater and larger samples are required.

3097. ZWÖLFER, H. Zur Kenntnis der Parasiten des Tannentriebwicklers *Choristoneura* (*Cacoecia*) *murinana* Hb. **[Parasites of *C. murinana*.]** *Z. angew. Ent.* 39 (4), 1956 (387–409). 11 refs. [G.e.] I.I.E.

During collections in the Vosges in 1955, 23 parasite species were reared. The degree of larval parasitization varied from 2 to 7%, and of pupal from 29 to 55%. Comparisons are made with parasite complexes in other parts of Europe. Among larval parasites *Glypta murinanae* dominates; among pupal parasites the chief are *Hoplectis maculator* and *Phaeogenes maculipennis*. The composition and, to a lesser degree, the effectiveness of the parasite complex is influenced by the ecological preferences and the phenology of the individual parasite species. Correlations also seem to exist between the phenology and the developmental phases of the host and its reduction by parasites. *From author's summary.*

3098. KULMAN, H. M., HODSON, A. C., and DUNCAN, D. P. **Preliminary observations of an inquiry into the effects of the defoliation of Jack Pine by the Jack Pine budworm [*Choristoneura pinus*].** *Minn. For. Note* No. 56, 1957. pp. 2.

A study of trees from an unsprayed area and from one sprayed from the air with DDT during the 3rd and 4th larval instars, indicated that: (1) spraying had materially reduced defoliation in all but suppressed crown classes; (2) in unsprayed areas, suppressed and regressive classes also suffered the heaviest defoliation; (3) in an area suffering one year of moderate and one of heavy defoliation, a high proportion of trees showed only slight damage in the 3rd year.

3099. OHNESORGE, B. Massenvermehrung des Fichtennestwicklers *Epiblema tedella* Cl. in Nordwestdeutschland. **[Mass outbreak of *E. tedella*

in N.W. Germany.] *Forst- u. Holzw.* 12 (5), 1957 (76–7). 3 refs. [G.]

Describes a severe outbreak, the first such in N.W. Germany, on 50 ha. of Spruce in the Teutoburger Wald, doing great damage and killing ca. 10 ha. outright. Data on the bionomics, habits etc. of the pest are given. No large-scale control has so far been tried.

3100. ELIESCU, G. Beiträge zur Kenntnis der Verteilung der Eier von *Tortrix viridana* L. auf den Zweigen. [**The distribution of the eggs of *T. viridana* on branches.**] *Beiträge zur Entomologie, Berlin* 5 (5/6), 1955 (462–72). 4 refs. [G.g.] I.I.E.

The number of eggs deposited per cm. on various parts of branches from different parts of two infested Oaks near Bucarest was counted. The number decreased from the tips of the branches in such a manner that when the sum total of eggs between any given point and the tip was plotted against the distance of that point from the tip, a regular curve was obtained, whose shape and direction could be used as a means for forecasting degrees of future infestation. Provided that the number of eggs on the top 30 cm. reaches 150, a count of this part alone is sufficient for a forecast.

3101. SCHWENKE, W. Untersuchungen zum Massenwechsel der Kiefernspanner *Bupalus piniarius* L. and *Semiothisa liturata* Cl. auf vergleichend-biozönotischer Grundlage. [**Population fluctuations of *B. piniarius* and *S. liturata* compared on a biocoenotic basis.**] *Beiträge zur Entomologie, Berlin* 4 (3/4), 1954 (388–451). 31 refs. [G.g.] I.I.E.

An analysis, describing methods of observation and computation, of the development of one generation of latent populations from pupal stage 1952 to pupal stage 1953, tracing the effect of environmental factors on the fluctuation of the populations in time, and on interspecific and local differences, on the basis of necessarily small numbers. Data on mean air and soil temperatures, rainfall and soil moisture, tree height, spacing etc., ground vegetation and populations of insect predators and parasites are given for the four 25-year Pine plantations (near Berlin) investigated. Population figures are related to weight of green needles, on the basis of sample trees. Parasites, many interspecific, accounted for most of the pupal mortality (11–18% in 1952, 18–40 in 1953). The most frequent were *Ichneumon nigritarius*, *I. bilunatus*, *Carcelia rutilla* and *Blondelia nigripes*. Egg mortality was practically nil. Mortality in the larval stage, computed at 97·5% for *B. piniarius* and 98·5 for *S. liturata*, was attributed about equally to predators and rain, but the conditions of 1952 are considered atypical (exceptionally wet). Both populations decreased. Soil moisture was considered the most important factor for local population differences, but the extremely low densities of the very dry (lichen) type of stand is seen not as a result of its dryness or greater temperature extremes but of the draughty microclimate between the widely-spaced, low trees, which prevented oviposition. [Cf. *F.A.* 17 No. 4179.]

3102. SCHWENKE, W. Vergleichende Untersuchungen über die Populationsdichte und einige sie regulierende Faktoren bei der Forleule (*Panolis flammea* Schiff.), den Kiefernspannern (*Bupalus piniarius* L. und *Semiothisa liturata* Cl.) und dem Kiefernschwärmer (*Hyloicus pinastri* L.) auf der Grundlage einer Einteilung der Kiefernwälder in Waldtypen. [**A comparative study of population densities and factors affecting them, for *P. flammea*, *B. piniarius*, *S. liturata* and *H. pinastri*, based on an ecological classification of Pine forests.**] *Beiträge zur Entomologie, Berlin* 4 (5/6), 1954 (673–83). 7 refs. [G.g.] I.I.E.

An analysis of 2 years' bionomic data, including parasitization, of latent populations in the pole and mature stages of a fresh and a dry Vaccinium type, and a mature dry moss/lichen type (the corresponding pole stage harboured hardly any insects) near Berlin. For *B. piniarius* and *S. liturata*, the two most frequent species, mortality through parasites was lowest and the increase of population greatest in the moss/lichen stand.

3103. KLOMP, H. Die morphologischen Merkmale und die Bionomie der Kierfernspanner-Tachine *Carcelia obesa* Zett. (= *rutilla* B.B.). [**Morphology and bionomics of *C. rutilla*, a parasite of *Bupalus piniarius*.**] *Z. angew. Ent.* 38 (3), 1956 (288–94). 8 refs. [G.e.] O.H.

3104. POSPÍŠIL, J. Pokus o užití Dykovy methody kontroly mnišky pro kontrolu tmavoskvrnáče borového. [**An attempt at applying Dyk's methods of controlling *Lymantria monacha* to the control of *Bupalus piniarius*.**] *Lesn. Práce* 35 (3), 1956 (105–9). [Cz.cz.]

In May 1954, the author collected a number of pupae of *B. piniarius*, found that the sex ratio was roughly 1/1, and incubated the ♀ pupae at a somewhat heightened temperature. The ♀s, which emerged earlier than in natural conditions, were immediately placed in containers made of waxed paper, with a gauze lid, and these were glued to plywood boards. Results showed that young, unfertilized ♀s (⩾ 7 days old) attract ♂s and can be used for their control. The distance of effective attraction is 5 m. in calm weather or when the ♂s are upwind. The attraction is of an olfactory nature. Since the success of attraction depends on a great number of factors, this method can only be used for estimating the size of an outbreak.

3105. SCHIMITSCHEK, E. Über den amerikanischen Webebär *Hyphantria cunea* Drury. [***H. cunea*.**] *Verhandlungen der deutschen Gesellschaft für angewandte Entomologie E.V., Frankfurt a.M. 1952*, 1954 (9–27). 18 refs. [G.] I.I.E.

Surveys distribution in Europe, life history, and environmental factors influencing it, and lists American and European parasites, including hyperparasites, and their relationships with native insects; also mechanical and chemical control, and importance for forestry. In Austria, only nurseries, plantations on poor land, and roadside trees were affected.

3106. HARVILLE, J. P. **Ecology and population dynamics of the California Oak moth, *Phryganidia californica* Packard (Lepidoptera: Dioptidae).** *Abstr. of thesis*, in *Dissert. Abstr.* 16 (7), 1956 (1300). O.R.S.

3107. GUNEV, I. T. Zlatozadkata i borbata s neja. [***Euproctis chrysorrhoea* and its control.**] *Gorsko Stopanstvo* 10 (4), 1954 (188–90). [Bulg.]

In Aug. 1952, $\frac{1}{10}$ ha. of a 20-year Oak stand attacked by *E. chrysorrhoea*, and a similar area of fruit orchard, were dusted with 1 kg. and 0·8 kg. respectively of a 5% DDT preparation. A 100% kill of larvae was secured. Identical results were obtained after another test in April 1953, a 100% kill being secured by May 5th.

3108. SCHWINCK, I. Freilandversuche zur Frage der Artspezifizität des weiblichen Sexualduftstoffes der Nonne (*Lymantria monacha* L.) und des Schwammspinners (*Lymantria dispar* L.) [**Field experiments on the specificity of the sexual attractant odours of *L. monacha* and *L. dispar*.**] *Z. angew. Ent.* 37 (3), 1955 (349–57). 11 refs. [G.g.] O.H.

Describes experiments with caged ♀s, in which under certain conditions, *L. monacha* ♂s were attracted by *L. dispar* ♀s, and vice versa.

3109. TILEV, G. Borovata procesionka i borbata sreštu neja. [***Thaumetopoea pityocampa* and its control.**] *Gorsko Stopanstvo* 10 (5), 1954 (214–6). [Bulg.]

Spraying of twigs in the immediate neighbourhood of a *T. pityocampa* 'nest' with a solution containing 1% each of Paris green (aceto-arsenite of Cu) and $Ca(OH)_2$ in January–February gave a 100% kill of larvae. BHC was less effective.

Coleoptera

See also Nos. 2455–8, 2506, 2907, 3026, 3069, 3082, 3201.

3110. OHNESORGE, B. Waldschäden durch Käfer. [**Damage to forests by beetles.**] *Forstarchiv* 26 (12), 1955 (274–83). 164 refs. [G.]

Part IV of a review of the more important works from 1943 to 1954. [Cf. *F.A.* 18 No. 1731.]

3111. ÇANAKÇIOĞLU, H. Bursa ormanlarında entomolojik araştırmalar. [**Entomological investigations in the Bursa forests.**] *Istanbul Üniv. Yay.* No. 690 (*Orm. Fak* No. 41) 1956. pp. vi + 41. 14 refs. [Turk.e.]

Lists for the Bursa forests the coleopterous and lepidopterous pests, those especially evident on burned areas, and species of Coleoptera new to the recorded local fauna. The steep slopes of Mount Uludağ in this area cover in a short distance all the climatic zones from the *Lauretum* to the Alpine.

3112. WACHTENDORF, W. Beiträge zur Kenntnis der Eichenprachtkäfer *Agrilus biguttatus* Fabr. und *Coraebus undatus* Fabr. (Col. Bupr.). [**Observations on *A. biguttatus* and *C. undatus*.**] *Z. angew. Ent.* 37 (3), 1955 (327–39). 11 refs. [G.g.] O.H.

Reports laboratory and field observations on both species, suggested by increased occurrence in the years 1948–50 when damage in parts of the Rhine and Danube valleys was considerable. Morphology, bionomics, habits etc., are described. Both species attacked only weakened trees, *A. biguttatus* generally caused rapid death, whereas attacks by *C. undatus* might be resisted for years. *C. undatus* occurs only on stems exposed to direct sunlight. *Quercus robur* was most susceptible on sites where the water-table had receded, *Q. sessiliflora* on clayey, frequently water-logged sites.

3113. MILLER, J. M., PERRY, J. P., JR., and BORLAUG, N. E. **Control of sunscald and subsequent buprestid damage in Spanish Cedar plantations in Yucatan.** *J. For.* 55 (3), 1957 (185–8). 1 ref.

Cleared strips in cut-over forest and savanna were line-planted in 1950 with seedlings of *Cedrela mexicana* from a local nursery. Examination after 2 years disclosed that 95% of the plants had suffered severe sunscald; in many plants, injured areas were invaded by borer, the seedlings being girdled and subsequently killed. Mortality was highest in the first year after transplanting. The beetle was found to belong to a new species and is described as *Chrysobothris yucatanensis*. Most infestation occurred in the rows nearest the forest edge. It was found that 27% of the plants had suffered sunscald before planting out; 5% of the injured plants were from the borders of the shaded nursery plots and subject to direct sunlight for part of the day; 22% were injured when exposed to full sunlight for short periods while being moved from nursery to planting site. Recommendations to protect planting stock are: (1) nursery shade should cover all the plants in the beds; (2) seedlings should have a 'hardening' period of gradually reduced shade shortly before transplanting; (3) nursery stock should have short protective strips of lath rejects wrapped loosely around the stem during removal, and afterwards stuck into the ground around the transplant to shade it.

3114. **The Elm leaf beetle [*Galerucella xanthomelaena*] in Ontario.** *Publ. Dep. Agric. Can.* No. 1004, 1957. pp. 2.

3115. PANAÏOTOV, G. N. Dăbovata bălha i borbata s neja. [***Haltica quercetorum* and its control.**] *Gorsko Stopanstvo* 10 (5), 1954 (217–8). [Bulg.]

Deals briefly with the life cycle and control of this leaf-beetle from observations made during outbreaks in various Bulgarian Oak forests, mainly coppice, in 1953. Eggs are laid on the underside of the leaves in early spring, hatching early in June. The larvae skeletonize the leaves, feeding first on one tree and then moving, sometimes all together, to neighbouring trees. Pupation, in the soil or in bark fissures, occurs in the first half of July. Adults emerge in early autumn, feeding on the leaves of trees near by and rapidly spreading to unattacked areas. Damage by the beetles is less severe and more dispersed than damage by the larvae. The beetles overwinter in the soil cover or cracks in the bark. DDT is effective against both beetles (*a*) and larvae (*b*). For (*a*), early spring or early autumn applications are best, but dispersion of the beetles makes adequate coverage difficult, and control of (*b*) is at once easier and more economical of insecticide.

3116. CRAMER, H. H. Untersuchungen über den grossen Pappelbock, *Saperda carcharias* L. **[Investigations on *S. carcharias*.]** *Z. angew. Ent.* 35 (4), 1954 (425–58). Many refs. [G.g.] I.I.E.

Biology, life history, distribution, ecology, type and extent of damage, and control methods are described. Since isolated trees are very susceptible to attack, it is advisable to grow Poplar in closed stands. Severely attacked trees should be eliminated from the stand before the end of May. After the appearance of the first-instar larvae, the most valuable portion of the stems should be sprayed with contact insecticides (preferably BHC preparations) in order to prevent oviposition. Since a generation lasts 2 years, control measures should be repeated the following year. [Cf. *F.A.* 16 Nos. 1990, 3210; 17 No. 4206.]

3117. GORIUS, V. Untersuchungen über den Lärchenbock *Tetropium gabrieli* Weise mit besonderer Berücksichtigung seines Massenwechsels. **[*T. gabrieli* and its population fluctuations.]** *Z. angew. Ent.* 38 (2), 1955 (157–205). 73 refs. [G.g.] O.H.

A monograph based on the literature and on the author's laboratory and field observations (the latter in various parts of Bavaria and Franconia) covering distribution, morphology, bionomics, enemies, control, etc. The beetle has so far been reported only as a secondary pest of Larch outside its natural range. Infestation tests indicated that susceptible trees have lower osmotic values than resistant trees on the same site, but no absolute critical values could be determined. Increases in population were shown to coincide with a succession of abnormally warm years. The extent of damage in the region examined was not great, but infested timber might be devalued as much as 50%. Control by felling and removing infested trees—often easiest to recognize by their woodpecker marks—is recommended. If left in the forest, they should be barked, treated with carbolineum, and the bark burned, and the stumps treated likewise.

3118. NIKLAS, O. F. Die Biologie von *Balanobius salicivorus* Payk. als Inquiline von *Nematus* (*Pontania*) Gallen an Weidenblättern (Coleoptera: Curculionidae; Hymenoptera: Tenthredinidae). **[The biology of *B. salicivorus*, an inquiline of *Nematus* galls on Willow leaves.]** *Beiträge zur Entomologie, Berlin* 5 (3/4), 1955 (276–86). 15 refs. [G.g.] I.I.E.

Discusses the life history and population fluctuations of this insect, found chiefly in the galls of *Nematus proximus* and sometimes in those of *N. vesicator*. It impedes the development of the tenthredinids, but does not actively attack them. Up to 24% of galls have been found to contain larvae of *B. salicivorus*. The adult feeds harmlessly on leaf buds.

3119. PIETRI-TONELLI, P. DE, and ROSI, O. Un nemico del pioppo, il *Cryptorrhynchus lapathi*, L. **[*C. lapathi*, a pest of Poplar.]** *Ital. agric.* 93 (12), 1956 (957–63). 9 refs. [It.] E.M.B.

An 0·5% solution of parathion, brushed on to the stems of 4-year-old Poplars (ca. 3 cm. diam.), killed all larvae of *C. lapathi* in the bark and to a depth of 1 cm. in the wood. The possibility of applying lower concentrations from power sprayers is under consideration.

3120. BRAMMANIS, L. Neue Brutstätten des grossen braunen Rüsselkäfers, *Hylobius abietis* L. **[New breeding places for *H. abietis*.]** *Forstwiss. Cbl.* 75 (3/4), 1956 (105–8). [G.g.]

Investigations in Swedish forests showed that *H. abietis* will breed in considerable numbers in piles of freshly peeled bark. The practice of leaving bark in the forest therefore favours the pest.

3121. HESSE, G., KAUTH, H., and WÄCHTER, R. Frasslockstoffe beim Fichtenrüsselkäfer *Hylobius abietis*. **[Feeding-attractants of *H. abietis*.]** *Z. angew. Ent.* 37 (2), 1955 (239–44). [G.] O.H.

Describes experiments in the isolation and chemical analysis of the attractants, distinct for taste and smell, contained in Spruce bark sap. Some of the components were tested separately. Of these the methyl ester of linolenic acid proved a stronger attractant than crude sap, and effective in extremely low concentrations ($1/10^{12}$). [Cf. *F.A.* 17 No. 4267.]

3122. KAUTH, H., and MADEL, W. Über die Ergebnisse der im Schwarzwald und Hunsrück von 1952 bis 1954 durchgeführten Freilandversuche zur Anlockung des grossen braunen Rüsselkäfers, *Hylobius abietis* L., mit Lockstoffen. **[Field tests in 1952–54 in the Black Forest and Hunsrück regions on the use of attractants in the control of *H. abietis*.]** *Z. angew. Ent.* 37 (2), 1955 (245–9). 12 refs. [G.g.] O.H.

The methyl ester of linolenic acid applied in artificial traps on filter paper, proved a stronger attractant than the attractant fraction of Spruce bark sap. A combination of methyl esters of fatty acids from linseed oil, similarly applied, at least equalled Spruce billets in attractiveness, and though initially somewhat weaker, had a more lasting effect. [Cf. preceding abstract.]

3123. NORDIN, V. J. **Insects associated with fire-scarred Lodgepole Pine in Alberta.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (6), 1956 (3).

During an investigation of stain and decay in fire-scarred Lodgepole Pine in 3 areas of Alberta, a number of insects were found in the 133 trees examined; 15 trees were infested with black carpenter ants (*Camponotus* sp.) and 83 with root weevil (*Hypomolyx* sp.). The latter may be responsible for the entry of rot fungi in the roots of Lodgepole Pine.

3124. **The White Pine weevil [*Pissodes strobi*] in Ontario.** *Publ. Dep. Agric. Can.* No. 1003, 1957. pp. 2.

3125. WICHMANN, E. Im europäischen Grossraum eingeschleppte Borkenkäfer. **[Barkbeetles introduced into the European region.]** *Z. angew. Ent.* 37 (1), 1955 (92–109). 85 refs. [G.] O.H.

In addition to continental Europe and the British Isles, Madeira and the Canary Islands are covered in some detail.

3126. SCHEDL, K. E. Die Kiefern-Borkenkäfer Guatemalas. **[The Pine barkbeetles of Guatemala.]** *Z. angew. Ent.* 38 (1), 1955 (1–48). [G.] O.H.

A list giving localities, host plants etc., stated to be very nearly comprehensive for the genera *Dendroctonus* and *Ips* (less so for others).

3127. FRANCKE-GROSMANN, H. Populationsdynamische Faktoren bei der Massenvermehrung des *Dendroctonus micans* Kug. an der Sitkafichte in Schleswig-Holstein. [**Factors affecting mass outbreaks of *D. micans* on Sitka Spruce in Schleswig-Holstein.**] *Verhandlungen der deutschen Gesellschaft für angewandte Entomologie E.V., Frankfurt a.M. 1952*, 1954 (108–17). 15 refs. [G.] I.I.E.

Describes the development of this insect from a secondary pest attacking chiefly trees weakened by *Fomes annosus* to a primary pest and its spread from poor afforestation sites to old forest, and discusses possible causes of population fluctuations, e.g. dry weather, and enemies. No relation was found between susceptibility to attack and stand density or light conditions.

3128. RUDINSKY, J. A., and VITÉ, J. P. **Effects of temperature upon the activity and the behaviour of the Douglas Fir beetle.** *For. Sci.* 2 (4), 1956 (258–67). 7 refs.

For *Dendroctonus pseudotsugae*, threshold temperatures for various degrees of activity are: > 0·5° C. unorganized, > 4° limited, > 10–11° moderate activity and flight ability, > 18–20° higher activity and take-off ability, > 26–28° optimum organized ability, 33–36° restlessness and thermal paralysis, leading to thermal death. At 10° beetles can still bore and move but have lost flight ability. Outside the bark they become negatively phototropic. At 33° boring and locomotion are restricted but flight is unimpaired. Between 18 and 22° flying starts and between 26 and 32° is the optimum regulated locomotion; between these two spans is the 'thermopreferendum'.

3129. MCMULLEN, L. H. **A note on the mortality of the Douglas Fir beetle [*Dendroctonus pseudotsugae*] in the interior of British Columbia during the winter of 1955–56.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (6), 1956 (3–4).

Heavy mortality of broods observed in a number of trees examined at a sawmill (at least 60%), is attributed to sudden and severe cold weather experienced generally in the Province in early November 1955, a time when the beetles were probably not prepared for such conditions.

3130. SCHREMMER, F. Beobachtungen über den Triebfrass des achtzähnigen Lärchenborkenkäfers (*Ips cembrae* Heer) im Wienerwald. [**Observations of shoot excavations of *I. cembrae* in the Wienerwald.**] *Z. angew. Ent.* 38 (2), 1955 (217–33). 4 refs. [G.] O.H.

Describes injuries to Larch by maturing beetles hollowing out shoots, causing them to break off. For one site it was estimated that during August every tree had lost ca. 200 twigs, 50–70 cm. long, and mostly ca. 6–8 years old.

3131. MARTÍNEK, V. Číselné vyjádření hustoty náletu kůrovce *Ips typographus* L. na kmenech při přemnožení. [**Numerical data on the infestation density of *I. typographus* on tree stems during a mass outbreak.**] *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 29 (6), 1956 (411–26). 9 refs. [Cz.cz.russ.g.*russ.g.*]

Presents results of a statistical analysis of the frequency distribution of brood galleries and boreholes in 85 Spruce bark specimens from standing stems or trap logs attacked by *Ips typographus*. During a mass outbreak, the most probable density was found to be 1·5–3 boreholes and 3–5 brood galleries per sq. dm. of bark surface. The frequency distribution curves agree well with theory.

3132. MARTÍNEK, V. Příspěvek k osvětleni problému sesterského pokolení u kůrovce *Ips typographus* L. [**An attempt at explaining the problem of sister broods in *I. typographus*.**] *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 29 (9), 1956 (615–44). 18 refs. [Cz.cz.russ.g.*russ.g.*]

A second egg-laying (first sister brood) and third egg-laying (second sister brood) by *Ips typographus* ♀s were observed in May–July 1954 in freshly felled Spruce logs placed under large metal-gauze covers into which adult insects were admitted. The experiments were made on the fringe of a forest, in half-shade. It was found that 91% of ♀s that had laid eggs normally and had done their maturation feeding, started laying eggs for the second time (ca. 23 days after the first brood); 38% of these ♀s, after their maturation feeding, started laying eggs for the third time. The second (first sister) brood was characterized by longer brood galleries and by greater broods than the first (normal) egg-laying.

3133. MERKER, E., and WILD, M. Das Reifen der Geschlechtsdrüsen bei dem grossen Fichtenborkenkäfer und sein Einfluss auf das Verhalten der Tiere. [**The maturation of the sexual glands in *Ips typographus* and its effect on behaviour.**] *Beiträge zur Entomologie, Berlin* 4 (3/4), 1954 (451–68). 23 refs. [G.g.] I.I.E.

The activity of the beetles was found to be closely related to the state of their sexual organs, which in young beetles is related to stages of pigmentation. Immature beetles and old beetles whose sexual organs have not yet regenerated, will not fly even if temperatures are suitable (ca. 23° C.). Light also affects flight propensities, but darkness does not prevent flight. *From authors' summary.*

3134. MERKER, E. Der Massenwechsel des grossen Fichtenborkenkäfers (*Ips typographus*) und seine Abhängigkeit vom Standort, sowie Bemerkungen über die standörtliche Gebundenheit des Massenwechsels anderer Waldverderber. [**Population fluctuations of *I. typographus* in relation to site conditions, also notes on the influence of site on the fluctuations of other pests.**] *Beiträge zur Entomologie, Berlin* 5 (3/4), 1955 (245–75). 20 refs. [G.] I.I.E.

Discusses the course of the epidemic in Baden in relation to the weather and conditions of various sites, particularly the water régime, as reflected in the osmotic values of the bark sap of standing trees; the effect of osmotic pressures and of scents on the attractiveness and susceptibility of trees; and briefly touches on the influence of soil climate on other forest pests.

3135. MERKER, E. Der Widerstand von Fichten gegen Borkenkäferfrass. **[The resistance of Spruce to barkbeetles.]** *Allg. Forst- u. Jagdztg.* 127 (7; 8/9), 1956 (129–45; 168–87). 48 refs. [G.e.]

A discussion of the factors favouring successful attack, chiefly on the basis of the author's own (published or unpublished) observations and experiments [cf. *F.A.* 15 Nos. 3831, 3834; 18 No. 674]. Studies of osmotic values of phloem saps showed that these varied with the season, the weather, the site, and the part of the tree, normal summer values being ca. 12 atm. below the crown and 7 atm. at the roots. Values tend to decrease in May and June in the lowlands and in July in the mountains, and to increase in the autumn. High values such as to attract beetles occurred most frequently below the crown during hot and dry weather. Subnormal values were rare in standing trees, indicating a wilting condition and lowered resistance to beetle attack, but not high initial attractiveness, which appeared to depend on the stronger scent from the more concentrated sap, as confirmed by further laboratory experiments. The osmotic values had no direct effect on the beetles. Osmotic values and moisture content of the bark of felled trap trees were also investigated. No differences as to attractiveness of sap from young and old trees was found, and the greater susceptibility of the latter is attributed to their more precarious water balance. Experiments with artificial infestation by beetles in cages attached to trees confirmed the importance of sufficient moisture in the tree for successful resistance. While the beetles succeeded in boring into all the trees, they could not develop normal galleries in sound, turgid stems. To overcome such trees, mass or repeated attacks are necessary.

3136. GROSCHKE, F. Zur Lebensweise und Bekämpfungsmöglichkeit des Eichenkernkäfers, *Platypus cylindrus* Fabr. **[The biology and control of *P. cylindrus*.]** *Verhandlungen der deutschen Gesellschaft für angewandte Entomologie E.V., Frankfurt a.M. 1952*, 1954 (103–7). [G.] I.I.E.

Decribes the morphology, development and habits of the insect. Removal of all infested standing or converted timber successfully controlled an outbreak near Ingolstadt. Chemical measures, using DDT, BHC, carbolic and other preparations, neither prevented attack on treated stumps nor killed existing broods, even when 40% carbolic acid was poured into bore holes 5 cm. deep. Artificial culture of ambrosia fungi, in order to investigate the possibility of control by antibiotics, is in progress. [Cf. *F.A.* 18 No. 3457.]

3137. ALPHEN DE VEER, E. J. VAN. Terdapatnja *Xyleborus destruens* Bldf. di-hutan[2] djati di Djawa. **[The occurrence of *X. destruens* in Teak plantations in Java.]** *Rimba Indonesia* 5 (7/8), 1956 (387–408). 4 refs. [Jav.e.e.]

[Cf. *F.A.* 13 No. 500.] Discusses its rapid increase since 1920 and the nature of the damage to timber. Recommends suspension of Teak planting in infested areas and in other areas too wet for Teak, and research on the effect of thinnings of different intensity and of an understorey of other species. *From author's summary.*

3138. WICHMANN, H. E. Zur derzeitigen Verbreitung des japanischen Nutzholzborkenkäfers *Xylosandrus germanus* Blandf. im Bundesgebiete. **[The present distribution of *X. germanus* in the German Federal Republic.]** *Z. angew. Ent.* 37 (2), 1955 (250–8). 16 refs. [G.g.] O.H.

The insect has been found in Oak/Beech forests near Darmstadt and in part of the Neckar and Upper Rhine valleys. Twelve host species from Germany, among them 2 conifers, are listed.

3139. GYÖRFI, J. Die in den Maikäfer und anderen Blatthornkäferlarven schmarotzenden Wespen. **[Wasps parasitizing the larvae of *Melolontha* and other lamellicorns.]** *Z. angew. Ent.* 38 (4), 1956 (468–74). [G.g.] O.H.

Describes the habits of wasps of the families Tiphiidae and Scoliidae observed in Hungary, and their economic importance, discussing also American and Russian experiments in biological control. The author suggests planting their preferred food plants, chiefly Umbelliferae, near forest nurseries.

3140. VOGEL, W. Entmischungen innerhalb der Maikäferpopulation im Zusammenhang mit dem Wandern der Käfer ins Waldesinnere. **[The sorting out [of sexes and stages of maturity] brought about by movements of *Melolontha melolontha* populations into the interior of forests.]** *Z. angew. Ent.* 38 (2), 1955 (206–16). 11 refs. [G.g.] O.H.

Test counts in Switzerland showed that a great many beetles of both sexes move on into the interior almost immediately after the swarm has settled on the forest border. There was a greater proportion of ♀s among the beetles caught in the interior, and these were generally more developed sexually. The importance of correct timing of control measures is stressed.

Hymenoptera

See also Nos. 2667, 3063, 3074, 3118, 3123.

3141. SPÎRCHEZ, Z. *Caliroa limacina* Retz—viespea neagră a cireşului în perdelele de protecţie de la Ceanul Mare-Turda. **[*C. limacina*, a pest of *Prunus* spp. in Black Sea shelterbelts.]** *Rev. Pădurilor* 71 (5), 1956 (314–7). 10 refs. [Rum.russ.g.]

Describes life history, damage, and control measures.

3142. **The red-headed Pine sawfly [*Neodiprion lecontei*] in Ontario.** *Publ. Dep. Agric. Can.* No. 1002, 1957. pp. 2.

3143. KRIEG, A. Untersuchungen über die Polyedrose von *Neodiprion sertifer* (Geoffr.). **[Investigations on the polyhedrosis of *N. sertifer*.]** *Archiv für gesamte Virusforschung, Wien* 6 (2/3), 1955 (163–74). 25 refs. [G.g.] W.A.H.

In laboratory experiments using oral infection by standardized virus, mortality was dependent on dosage and temperature, but not on humidity or age of larvae, though fourth-instar larvae sometimes escaped death by premature pupation. The dosage causing a 50% kill lay between 50 and 100 polyhedra. The 'yield' per host larvae was ca. 3300. *From author's summary.*

3144. **The yellow-headed Spruce sawfly [*Pikonema alaskensis*] in Ontario.** *Publ. Dep. Agric. Can.* No. 1001, 1957. pp. 2.

Diptera

See also Nos. 3062, 3071.

3145. FOOTE, R. H. **Gall midges associated with cones of western forest trees (Diptera: Itonididae).** *J. Wash. Acad. Sci.* 46 (2), 1956 (48–57). 4 refs. L.S.

From studies of an extensive collection of gall midges, names and morphological descriptions with drawings are given for mature stages of a number of species occurring in cones and seeds of Western conifers, viz. *Rübsaamenia keeni*, *Holoneurus strobilophilus*, *Dasyneura abiesemia*, *Phytophaga carpophaga*, *Janetiella siskiyou*, *Contarinia oregonensis*, *Mycodiplosis conicola*, *M. coryloides* and *Lestodiplosis taxicomis*.

3146. RUIZ CASTRO, A. Una plaga del boj (*Monarthropalpus buxi* Lab.). **[A pest of Box, *M. buxi*.]** *Boletin de Patología Vegetal y Entomología Agrícola, Madrid* 20, 1953/1954 (1955), (345–67). 21 refs. [Span.] I.I.E.

Morphology, life history, damage (leaf-mining) and control measures. [Cf. *F.A.* 18 No. 3071.]

3147. REEKS, W. A. **The occurrence of *Retinodiplosis* sp. on Jack Pine in Manitoba and Saskatchewan.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (6), 1956 (2–3).

Scattered records of infestation, usually associated with attacks by *Choristoneura pinus* or *Petrova albicapitana*. The significance of this association has not been determined.

3148. MÖHN, E. · Eine neue Gallmücken-Gattung aus Harzwunden an Tanne. **[A new genus of gall midges from resin-secreting wounds on Silver Fir.]** *Z. angew. Ent.* 38 (1), 1955 (97–102). 13 refs. [G.] O.H.

Wichmaniella crassa gen. et. sp. nov.

459. Other Animals

3149. PETERSON, G. D., JR. ***Lamphrophorus tenebrosus* introduced into Guam to combat the giant African snail [*Achatina fulica*].** *J. econ. Ent.* 50 (1), 1957 (114). 3 refs.

A laboratory note indicating that when juvenile specimens of (1) *A. fulica*, (2) *Gonaxis kibweziensis* (another snail predatory on it), and (3) immature *L. tenebrosus* (an Indian glow-worm) were confined together, both (2) and (3) attacked and killed (1), but not each other.

46. Damage to Tree Growth by Man

See No. 3201.

48. Injuries Due to Unknown or Complex Causes

3150. MEYER, H. Das Verlustkonto der Edeltanne (*Abies alba*). **[The regression of Silver Fir [in Germany].]** *Forst u. Jagd* 5 (7), 1955 (276–8). [G.]

Discusses the constant shrinkage of the area under Silver Fir in Germany as a whole and especially in Saxony and Thuringia, where it has nearly disappeared, on the basis of early statistics and old records, and urges measures to prevent its becoming extinct along the N.E. border of its range.

3151. SÄTTLER, R. Tannensterben und Wiedereinbringung der Tanne. **[Silver Fir mortality and re-establishment.]** *Forst u. Jagd* 5 (8), 1955 (317–20). [G.]

Includes observations of sudden or slow mortality in the Erzgebirge, and local experience with artificial regeneration, including nursery practice, the planting out of 4-year-old seedlings, or preferably transplants, spaced 1·30 × 1·60 m. in groups, and direct sowing in open Spruce stands. Careful manipulation of light, and fencing, are essential.

3152. HAHN, G. G., and ENO, H. G. **Fungus association with Birch 'dieback' and its significance.** *Plant Dis. Reptr.* 40 (1), 1956 (71–9.) 16 refs. A.P.B.

Investigations were made into crown and root fungi isolated from *Betula lutea* and *B. papyrifera* suffering from dieback in Maine and New Hampshire. The list of crown fungi isolated is very similar to that reported from Canada. Inoculation experiments were carried out with *Phomopsis* sp., *Melanconium betulinum*, *Gelatinosporium fulvum*, *Fusarium* spp. and *Melanconis nigrospora*, but none proved pathogenic. Only one root fungus, tentatively identified as *Cylindrocarpon orthosporum*, was so commonly isolated as to appear of importance, but no deterioration of healthy Birch saplings resulted from inoculations of the soil with this species. A special search for *Phytophthora cinnamomi* in Maine was without result, and no rhizomorphs of *Armillaria mellea* were found. The mycorrhizal fungi *Mucor ramannianus* and *Mycelium radicis nigrostrigosum* were frequently found on both healthy and diseased trees. *From authors' summary.*

3153. TIMELL, T. E. **Effect of Birch dieback on the chemical properties of White Birch [*Betula papyrifera*] wood.** *Pulp Paper Mag. Can.* 58 (1), 1957 (97–9). 8 refs.

Analyses of the sap- and heart-wood of one healthy and 3 variously decadent stems show that effects of die-back are not apparent in the content of α-cellulose, lignin, pentosan, uronic anhydride, and alkali solubles, or in the chain length of the cellulose component, or in yield and quality of pulp. Diseased material was from Eastern Townships, Quebec, where all *B. lutea* were healthy.

3154. FERGUS, C. L., and IBBERSON, J. E. **An unexplained extensive dying of Oak in Pennsylvania.** *Plant Dis. Reptr.* 40 (8), 1956 (748–9). 3 refs. A.P.B.

Observations are presented on a disease affecting Red, Scarlet and some Black Oaks near Bloomsburg, Williamsport and Renovo. Examination of dead and dying trees showed a marked reduction of increment over the past 5 years or more. Failure of the foliage to develop is an initial symptom. This is followed by a gradual decline in vigour. No

pathogens have been isolated. Similar symptoms have been observed in New York, W. Virginia and New Jersey.

3155. GILLESPIE, W. H., and TRUE, R. P. **Observations on Scarlet Oak [*Q. coccinea*] mortality in eastern West Virginia.** *Abstr.* in *Phytopathology* 47 (1), 1957 (13).

This unexplained mortality, similar to that reported from Pennsylvania, New York, and New Jersey, causes appreciable losses of this and of scattered Red and Black Oaks. No causal fungi have been found, but cankers occur like those caused by drought in Oaks and Red Maple. The area affected follows closely the tilted Devonian shales that give rise to the Ashby and Calvin soil types.

3156. KHAN, A. H., *et al.* **Observations on the mortality of Shisham (*Dalbergia sissoo* Roxb.) and other trees in Khanewal Plantation.** *Pakistan J. For.* 6 (2–4), 1956 (109–26; 203–20; 289–301). 38 refs.

As no pathogen was found to account for the serious mortality in this irrigated plantation, studies were made of the roots of Shisham and other affected species. The dead and unhealthy trees were usually found where there was a *kankar* layer restricting root development. The evil effects of this had been aggravated by faulty irrigation practices.

3157. SINHA, R. L. **Mortality of 'Sal' [*Shorea robusta*] in Gorakhpur Forest Division, Uttar Pradesh.** *Indian For.* 83 (1), 1957 (47–53).

Reviews the adverse factors that probably combine to cause the serious dieback of *S. robusta* in this region, including over-exploitation, unregulated grazing, fire, and deficient and erratic rainfall.

5. FOREST MENSURATION. INCREMENT; DEVELOPMENT AND STRUCTURE OF STANDS. SURVEYING AND MAPPING

See also No. 2400.

52. Measurements of Stem Dimensions and Volume of Trees, Stands, Forests and Timber

521. Diameter (Girth) and Sectional Area

See also Nos. 3166, 3216–7.

3158. KORSUŇ, F. **Zaokruhlování výčetních tlouštěk. [The rounding off of d.b.h. values.]** *Sborn. čsl. Akad. zeměd. (Lesn.)* 29 (6), 1956 (445–50). [Cz.russ.e.g.]

Discusses the accuracy of measurements based on calipering. In order to obtain stand volume figures of a given degree of accuracy (i.e. the error not to exceed a stated figure but avoiding unnecessary precision in caliper readings), it would be advisable to have the caliper graduated up to 19 cm. in 1-cm. intervals, from 19 to 29 cm. in 2-cm. intervals, from 29 to 39 cm. in 3-cm. intervals, and so on.

3159. AFANASIEV, M. **The Bitterlich method of cruising—why does it work?** *J. For.* 55 (3), 1957 (216–7). 1 ref.

Explains with examples the theoretical bases of Bitterlich's *Winkelzahl* method.

522. Height, Length

See also No. 3216, 3218–9, 3221.

3160. KER, J. W., and SMITH, J. H. G. **Sampling for height-diameter relationships.** *J. For.* 55 (3), 1957 (205–7). 5 refs.

In determining height/diameter relationships it is customary to measure the d.b.h. of all the trees on the sample plot, but the height of only a small %. Tests were made to find the number of tree heights required to give an accurate estimate. The d.b.h. and height were known for 181 trees in a 65-year-old stand. The trees were grouped by species, viz. Western Hemlock, Western Red Cedar, and Amabilis Fir; Douglas Fir was further divided into 5 groups by site index. In each of the 8 groups, 6 methods of sampling height were examined and the standard error (s.e.) for each method calculated. The smallest s.e. was obtained by taking the height of the 2 trees with the smallest and 2 with the largest d.b.h. In this method the s.e. is significantly correlated with the difference in d.b.h. between the small and large trees. Good results will be obtained if the d.b.h. of the small trees is $< 30\%$ of that of the large trees. An increase in the number of tree heights taken did not reduce the s.e. More study is needed to determine the best distribution and intensity of sampling.

523. Bark

3161. POSEY, H. G. **Indications of linear dependence of d.o.b. increases on d.i.b. increases in Loblolly Pine at 17·3 feet.** *J. For.* 55 (2), 1957 (145). 1 ref.

Presents data supplementary to those given by McCormack [see *F.A.* 17 No. 3095].

524. Determination of the Volume of Trees and Stands

524.1. Principles of Volume Determination. Form (Taper)

See also Nos. 3165, 3205.

3162. BAY, E. **Sulla rastremazione dei fusti di piante resinose. [The taper of conifer stems.]** *Monti e Boschi* 8 (2), 1957 (88–9). [It.]

Assuming a paraboloid form for the stem of a tree, works out values for the equation $y = a.x^{0.5}$ where y = radius of horizontal sections in cm., x = distance from top of crown in m., and a is a constant.

524.3. Volume of Tree Groups and Stands

See also No. 3217.

3163. PANDJI. **Daftar tabel² hasil, pohon, voluma kaju pertukangan dan tabel² pembantu**

untuk Indonesia. **[List of yield, volume and auxiliary tables in use by the forest service in Indonesia.]** *Spec. Publ. For. Res. Inst., Bogor* No. 10, 1956. pp. 11. [Jav.E.]

Includes yield tables for 9 species and volume tables for 19 species.

3164. SUDARMO, M. K. Tabel-volume untuk *Agathis loranthifolia* (= *A. alba*). **[Volume table for *A. alba*.]** *Commun. For. Res. Inst., Bogor* No. 53, 1956. pp. 8 + 1 tbl. [Jav.E.]

3165. RADWAŃSKI, B. Tablice miąższości i zbieżystości dłużyc, kłód i wyrzynków strzały dla świerka. Książka I. **[Volume and taper tables for *Picea abies* tree-length logs, logs and stem sections. Book I.]** *Roczn. Nauk leśn.* No. 16, 1956 (3–239). 4 refs. [Pol.russ.e.] Price *Zł.*51.

The tables, based on Polish experimental data obtained from sections of 4736 trees felled between 1936 and 1953, resemble those for Scots Pine [see *F.A.* 17 No. 4281]. Book I comprises tables of volume u.b. and taper of whole stems, showing cumulative volume by 1-m. steps proceeding up the stem, for trees of 10–35 cm. d.b.h. over bark and 12–41 m. height.

3166. CARRON, L. T. **Site classification and volume assessment of a *Pinus radiata* plantation, Kowen, A.C.T.** *Aust. For.* 19 (2), 1955 (141–5). 8 refs.

The site classification and volume assessment of 936 acres of *P. radiata* plantation, age 13–27 years, at Kowen, A.C.T., is described. The site classification was based on an age/height relationship with sites indexed by 'mean height' attained, or anticipated, at 20 years. Site classification was carried out directly on plan in the field using 'tallest height' as the index. Volume estimates were obtained through a stratified random sample of 'angle-counts' of b.a. per acre, a simple volume/b.a. relationship of sample trees, and a volume table compiled by multiple regression from actual sample trees. A stand volume table was compiled by multiple regression as a means of obtaining present volume estimates on future occasions. *Author's summary.*

3167. YOUNG, H. E. **Additional volume tables for Maine.** *Misc. Publ. Me. agric. Exp. Sta.* No. 627, 1957. pp. 40.

[Cf. *F.A.* 16 No. 4382.] A number of tables have been included that are useful in determining the volume of the major tree species where Girard form class and/or merchantable length are involved. Other new tables show the relationship of stump diameter to d.b.h., and there are pulpwood cull tables.

3168. MATHAUDA, G. S. **Compilation of volume tables.** *Proc. 8th silv. Conf., Dehra Dun 1951*, Part 2, 1956 (16–8).

Lists Indian species for which volume tables have been compiled, with bibliographical details.

3169. HUMMEL, F. C. Die Massengerade als Grundlage von Einheitstarifen für den Altersklassenwald. **[The volume/basal-area line as the basis for general tariff tables in even-aged forest.]** *Forstwiss. Cbl.* 75 (3/4), 1956 (91–105). 10 refs. [G.g.]

An exposition of the methods of Hummel [cf. *F.A.* 16 No. 4377]. Tariff tables drawn up on this basis show a high degree of agreement with those of Loetsch [cf. *F.A.* 14 No. 2519].

524.4. Recording of Data. Organization of Measuring Parties and Their Work

3170. RUDOLPH, V. J., and SHERRILL, B. C. **Field key-punching and mark-sensing of forestry research data.** *Quart. Bull. Mich. Agric. Exp. Sta.*39 (2), 1956 (270–7). 5 refs.

Three inventory methods for recording and compiling forestry research data in the field were each applied to a 2-acre forest plot, viz. (*a*) listing the data on field tally forms and compiling by manual office procedures, (*b*) recording data in the field on mark-sensing cards which are later punched automatically by a machine with an electronic feature sensitive to pencil marks, and compiling by tabulating machine, and (*c*) using a portable hand-operated key-punching machine and compiling as (*b*). The comparative times and costs of the 3 methods are tabulated; (*c*) was fastest and cheapest, and as accurate as (*b*), and is particularly suitable for large-scale operations; (*a*) was more than twice as costly as (*c*).

524.6. General Surveys of Forests and Whole Tracts of Forest. Partial Enumeration Surveys, Timber Cruising

See also Nos. 3159–60, 3166.

3171. HAGBERG, E. **The new Swedish national forest survey.** *Unasylva* 11 (1), 1957 (2–8, 28).

Describes the methods to be used in the new inventory begun in 1953 and planned to be completed in 1962, and the way in which it has been designed so as to yield data that can be compared with those from previous surveys.

3172. LINDSEY, A. A. **Sampling methods and community attributes in forest ecology.** *For. Sci.* 2 (4), 1956 (287–96). 15 refs.

Discusses the quadrat, line-strip, line-interception, random-pairs, point-centred-quadrant and Bitterlich methods in regard to the desiderata of rapidity, low equipment and crew requirements, collection of essential data (frequency, density, basal area) and susceptibility to statistical check. Definitions of the attributes of these methods are revised and symbols assigned, and a comparative table of formulae is presented, with columns for density, mean area, abundance, b.a., cover etc., and rows for the appropriate bases, e.g. per plot, per unit length, acre, etc. Two new summary expressions that integrate cover—*prevalence* and *predominance*—are suggested. [Cf. *F.A.* 15 No. 4386.]

3173. FRAUENDORFER, R. Planung und Durchführung von Stichprobenahmen. **[The planning and practical execution of sampling surveys.]** *SchrReihe forstl. VersAnst. Mariabrunn* No. 6, 1957. pp. 65. [G.]

An exposition of the chief points of sampling theory and procedure for the forester, supported by

an analysis of the results of various methods of sampling (random and systematic, density, size of plots etc.) based on a full enumeration of 1 ha. of Pine with some Spruce and scattered hardwoods, divided into 100 square plots of 100 sq. m. The investigation covered species distribution, height, diameter, bark thickness, crown classes, crown length and stem quality. Systematic sampling errors tended to be below the calculated errors for random sampling.

3174. WECK, J. Beitrag zur Frage 'Stichproben oder Vollkluppierung?' **[Sampling or full enumeration?]** *Schweiz. Z. Forstw.* 108 (1), 1957 (15–24). [G.f.]

A short description of the traditional German methods, the Gurnaud/Biolley method and Loetsch's sampling method, stressing the advantages of scientific sampling, and its applicability to all silvicultural systems.

3175. SETH, S. K. **A comparative study of some patterns of systematic partial enumerations for the plains Sal (*Shorea robusta*) forests.** *Proc. 8th silv. Conf., Dehra Dun 1951*, Part 2, 1956 (376–91).

Describes in detail enumerations made to compare times, costs, and efficiency of (*a*) total enumerations, (*b*) strip sampling at different intensities, and (*c*) line-plot sampling at different intensities. The following conclusions and recommendations are made: (*b*) and (*c*) are the most convenient to carry out; for (*c*), rectangular plots are more convenient than other shapes and 0·2-acre plots are better than 0·1-acre; (*b*) involves considerably larger sampling errors than (*c*) with 0·2-acre plots. The same order of accuracy may be expected from a 3% (*c*) and a 20% (*b*) sampling. Since a 10% (*b*) sampling costs as much as a 5% (*c*) in time and money, it is advantageous to do (*c*) surveys up to a maximum intensity of 5% rather than (*b*) surveys of $> 10\%$. Using a line-plot sampling intensity of $< 5\%$, a saving of at least 50% in time and cost over total enumerations may be expected. These conclusions apply to the enumeration of areas of a few thousand acres in the plains Sal forests.

3176. SETH, S. K. **A comparative study of some patterns of partial sampling suitable for the hills.** *Proc. 8th silv. Conf., Dehra Dun 1951*, Part 2, 1956 (395–409).

Describes the difficulties of conventional sampling methods in rugged Himalayan terrain, and a system of 'topographical' sampling units devised by the author [see *F.A.* 12 No. 3489]. Experiments (described in detail) have shown that such units can be demarcated only in accessible areas of moderate gradient. It should on the whole be easier, cheaper, and sufficiently accurate for working-plan purposes, to enumerate by existing compartments as sampling units.

3177. NAIR, K. R., and BHARGAVA, R. P. **Statistical sampling in timber surveys.** *Proc. 8th silv. Conf., Dehra Dun 1951*, Part 2, 1956 (339–45). 10 refs.

Reviews work by A. L. Griffith [cf. *F.A.* 8 No. 2151] and D. J. Finney [cf. *F.A.* 12 No. 3488] and others, that has established the superiority of the line-plot method of sampling in Indian conditions, and describes some experimental enumerations using this sampling technique.

3178. KADAMBI, K. **The efficiency of the 'spot method'.** *Proc. 8th silv. Conf., Dehra Dun 1951* Part 2, 1956 (371–5).

Describes an experimental enumeration made in 4 compartments of moist deciduous forest, to compare the merits of strip and 'spot' (line-plot) sampling. For the conditions of the experiment (natural forest with a large number of species and patches of varying density) the line-plot method proved to be more accurate, more rapid, and cheaper.

525. Volume by Assortments. Merchantable Volume

See also No. 3482.

3179. MÜLLER, G. Mathematische und technologische Betrachtungen über die Krummschaftigkeit. **[Mathematical and technological considerations on sweep.]** *Arch. Forstw.* 5 (5/6), 1956 (329–38). 7 refs. [G.g.]

Sweep, as here considered, is confined to one plane. For simplification it is the arc (b) $\simeq$ to the curved length (l) of the log and cut off by the chord (s) $\simeq$ the straight line (a) joining the ends of the log. The segment cut off has a height (h) and is subtended by the angle ϕ at the centre of the circle corresponding to the arc. The mean sweep is

$$\frac{b}{s} = \frac{l}{a} = \frac{\text{arc } \phi}{2.\sin \phi/2}$$

and the maximum sweep is $\frac{h}{s} = \frac{1}{2} \tan \frac{\phi}{4}$. To find b, 2 or 4 curved lengths along opposite sides of the log are measured and their mean value calculated; s is the distance between the centres of the cross-cut ends; the most generally acceptable h is an offset to the log from the chord joining the ends of the inner curve of the log. The errors and difficulties of these measurements are discussed. For standing trees, as good or better results are obtained by stereophotography. For sweep in one plane a tolerance of $\phi = 20°$ is acceptable, with corresponding h/s 0·04 and l/a or b/s, 1·005 or, as generally stated, 0·5%.

526. Log Measurement. Scaling

3180. SIMMONS, F. C. **Scaling practices at northeastern sawmills.** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 87, 1956. pp. 9.

Observations of > 800 sawmills showed that ca. $\frac{1}{4}$ of the total volume of sawlogs handled is not scaled; this is usually the case at the smaller sawmills. The remainder are scaled by one of 7 rules, the most popular of which are the Doyle, Maine, and Vermont rules. Instruction in more accurate methods of scaling is needed for sawmill operators; current methods often give excess volumes, as lower-quality logs are now accepted at most mills.

3181. HALL, O. F., and RUDOLPH, T. D. **Weight loss of stored Jack Pine pulpwood [in Minnesota].** *Minn. For. Note* No. 57, 1957. pp. 2.

In view of the increasing practice of selling pulpwood by weight instead of by the scaled cord, a study was made of loss of weight (*a*) in winter, (*b*) in summer, of pulpwood (1) from inside a stack, (2) from the exposed surface of the stack. It was found that weight loss in 1 month expressed in % of green weight was: (1*a*) 1·41, (1*b*) 3·27, (2*a*) 0·05, (2*b*) 5·77; the corresponding value loss in dollars/cord was $0·24, $0·56, $0·01, and $0·98.

3182. TARAS, M. A. **Buying pulpwood by weight as compared with volume measure.** *Sta. Pap. Stheast. For. Exp. Sta.* No. 74, 1956. pp. 11. 15 refs.

Discusses the various factors affecting the solid volume of cords and more particularly, the weight per cord, such as density and moisture content, and compares actual weights with calculated figures based on average values and with the empirical conversion factors adopted by pulpmills, chiefly for Southern Pines. Buying by weight is considered advantageous to both buyer and seller for various reasons, e.g. greater speed and objectivity.

527. Solid Volume of Stacked Products (including Converting Factors)

See also Nos. 3181–2.

3183. YOUNG, H. E., LAVERTY, R. E., and STOECKELER, E. G. **Airphoto inventory of pulpwood in water storage.** *Photogramm. Engng.* 22 (4), 1956 (696–702). 9 refs. L.S.

Inventory of pulpwood contained in water-storage areas near paper mills is a problem to mills dependent on water transport or water storage. A study was conducted to determine the degree of accuracy with which pulpwood sticks can be counted in aerial photos, and to develop sampling techniques to determine the cord volume of large pulpwood water-storage areas by such means. Pulpwood sticks in five small test booms were counted by two photo interpreters. The density of pulpwood sticks in the booms and the clarity of the photos were such that considerable accuracy was achieved. Stick counts ranged from 10 to 70 in the 250 sample plots located in the water-storage areas. A Kelsh plotter was used to delineate water-storage areas, and acreage was determined by planimetry. By use of standard statistical procedures, the plot counts were expanded to determine the cord volume in each water-storage area, with the error of estimate at 19/1 odds. Clarity of the photograph is the most important factor contributing to the accuracy of counts. Stick density is also important, and it may be necessary to establish factors to apply to sample counts that tend to be low. Results of this pioneer study indicate the feasibility of the photo-interpretation and sampling procedures described. *From authors' summary.*

53. Special Measurements of Trees and Stands (Crown Dimensions, Stand Density etc.)

See also Nos. 3194–5, 3206, 3216–7, 3222.

3184. LEMMON, P. E. **A spherical densiometer for estimating forest overstorey density.** *For. Sci.* 2 (4), 1956 (314–20). 7 refs.

Describes the construction and use of two simple pocket models, incorporating a highly polished chrome mirror (2·5 in. diam., curvature of a 6-in. sphere), a grid and a circular spirit-level. One model uses the convex side with the grid scratched on it, the other the concave, with the grid in the lid which can be set at 45°. For determining from any point the relative amount of light cut off by the canopy, the average measurements of different operators can be expected to be within $\pm$ 3·1% at 99% probability.

54. Assessment of Site Quality

See also Nos. 3166, 3192, 3207, 3601.

3185. GEVORKIANTZ, S. R. **Site index curves for White-Cedar in the Lake States.** *Tech. Note Lake St. For. Exp. Sta.* No. 472, 1957. pp. 2.

3186. GEVORKIANTZ, S. R. **Site index curves for White Spruce in the Lake States.** *Tech. Note Lake St. For. Exp. Sta.* No. 474, 1957. pp. 2.

3187. GEVORKIANTZ, S. R. **Site index curves for Black Spruce in the Lake States.** *Tech. Note Lake St. For. Exp. Sta.* No. 473, 1957. pp. 2. 1 ref.

3188. SMITH, J. H. G., and KER, J. W. **Some problems and approaches in classification of site in juvenile stands of Douglas Fir.** *For. Chron.* 32 (4), 1956 (417–28). 9 refs.

Although several easily determined, single-factor approaches to estimation of site quality are available for use in juvenile stands of *Pseudotsuga taxifolia*, none of them is wholly suitable. Conventional height/age relationships in use are based on scanty data for very young stands, are most representative of fully stocked stands, and depend considerably upon the yield table used as a reference. Recently the growth-intercept method has been developed and tested fairly generally [cf. *F.A.* 16 No. 356; 17 No. 1851]. It employs the lengths of the first few internodes above breast height as indicators of site quality. This method has the advantages of direct measurement and early classification, but indicates current or juvenile site qualities rather than total site capabilities over a long period of time. The utility of another measure of site quality—number of years to reach breast height—is demonstrated by data secured in this study. Schmidt [cf. *F.A.* 16 No. 4400] illustrated possible uses of stump diameters to indicate site quality; unfortunately only past site quality is estimated and direct examination of stumps is necessary. Topographic positions (ridge, upper slope, lower slope, and valley) are, in themselves, often indicative, as are species and abundance of lesser vegetation, but these latter interrelationships are often complicated and require expert interpretation. This report illustrates certain problems and possible uses of most of the above-mentioned methods; it also discusses problems of age-class distribution and succession. Data used were collected in Douglas Fir types in the University Research Forest at Haney and on Vancouver Island. *From authors' summary.*

3189. CARMEAN, W. H. **Suggested modifications of the standard Douglas-Fir site curves for certain**

soils in southwestern Washington. *For. Sci.* 2 (4), 1956 (242–50). 16 refs.

Site curves for Douglas Fir (140 ft. at 100 years) are calculated for the author's soil groups [see *F.A.* 16 No. 759]. These curves agree with the Standard Pacific Northwest curves [see *F.A.* 12 No. 823] for stands on basalts, sandstones and shales. For the gravels and sands, and for soils with imperfect internal drainage, the curves are markedly different, leading respectively to over- and underestimates of site quality for stands of < 100 years. Modified curves are presented for these two soil groups. Additional yield-table data and site-curve studies are required, covering a wider age range and differentiating the shape of curves for different site classes within the soil group.

3190. HARTMANN, F. K. Zur Bedeutung der Grundlagenerhebung in der Forstwirtschaft, insbesondere durch Standorts- und Vegetationskartierung und deren Kombinierung (mit besonderer Berücksichtigung des Bauernwaldes). [**Ascertaining basic facts in forestry, particularly by combined site and vegetation mapping (with special reference to farm forests).**] *Abstr.* in *Forsch. u. Berat.* (*Forstw.*) *Landesaussch. landw. Forsch. Landes Nordrhein-Westfalen* No. 2, 1956 (25–32 + 4 dgms.). (G.]

Suggests a method of site characterization based chiefly on vegetation, which, once the vegetation of a region has been classified, is cheaper and quicker than separate vegetation and site (i.e. chiefly soil) surveys. The importance of this for the small owner of limited means is stressed, and schematized sample diagrams for the Lower Rhine, the Eifel, and the Berg country are presented.

56. Increment. Development and Structure of Stands

See also Nos. 2629, 2689, 2702, 2704 *et seq.*, 2804–7, 2815, 2834, 2837, 2838 *et seq.*, 2880.

3191. NAKANO, M., and KOJIMA, H. [**Fundamental experiments on natural regeneration. (VII). The relationship between the vegetation form [ground cover type] and the growth of the forest tree.**] *Spec. Rep. For. Exp. Sta., Hokkaido* No. 4, 1955 (23–35). 4 refs. [Jap.jap.e.e.]

Compares graphically the growth in height, diameter, and volume, of natural mixtures of *Abies mayriana, Picea jezoensis* and *P. glehnii* in *Sasa, Dryopteris, Rhododendron*, moss and *Carex* types, and tabulates them in order of best growth for growth components and ground cover type. [Size of population not stated.] [Cf. *F.A.* 17 No. 2617.]

3192. HUSCH, B., and LYFORD, W. H. **White Pine growth and soil relationship in southeastern New Hampshire.** *Sta. tech. Bull. N.H. agric. Exp. Sta.* No. 95, 1956. pp. 29. 23 refs.

A study of the growth of White Pine [*Pinus strobus*] in south-eastern New Hampshire was conducted during 1952–55. Regression analyses revealed that the total height and d.b.h. of the average dominant and codominant trees on the study plots were significantly related to total age, density of the stand in terms of b.a. and number of dominants and codominants per acre, and the natural drainage class of the soil. A volume regression was developed to express total cu. ft. vol./acre based on total age, total height of the average dominants and codominants, and stand density in terms of b.a./acre. Seventy-three plots were sampled on 31 different soils for the height regression, and 45 plots on 25 different soils for diameter and volume regressions. Eight natural soil-moisture drainage classes were recognized, ranging from excessively drained to permanently wet. Suitable sample plots were found only on soils of the first 7 classes, i.e. up to, but not including, permanently wet soils. The following were the principal results of the study: (1) Total height of average dominants and codominants increased ca. 1 ft. per drainage class for the drainage classes observed. (2) Total height of average dominants and codominants increased ca. 1 ft. per 13 sq. ft. of increase in b.a. (3) As the soil drainage becomes poorer, d.b.h. of the average dominant and codominant increases ca. 0·13 in. per drainage class. (4) The d.b.h. of the average dominant and codominant decreases at a diminishing rate, as the number of dominants and codominants increases. (5) When the volume and height regressions are used concurrently, it is possible to estimate the cu. ft. vol./acre for each drainage class. *From authors' summary.*

3193. KLEPAC, D. Istraživanja debljinskog prirasta jele u najrašírenijim fitocenozama Gorskog Kotara. [**Studies on the diameter increment of *Abies alba* in the largest phytocoenoses of Gorski Kotar.**] *Glasn. šumske Pokuse* No. 12, 1956 (225–56 + 1 dgm., 2 gphs., 2 tbls., 1 map). 29 refs. [Croat.croat.f.*f.*]

A fuller account of the studies presented to the 1956 I.U.F.R.O. Congress [see *F.A.* 18 No. 759].

3194. [**Relation between standing b.a./acre and b.a. increment/acre for Slash Pine in Queensland.**] *Rep. Dir. For. Qd. 1955/56*, 1956 (12–3).

Data from a series of plots established in 1951 indicate that: (1) there is a close relationship between standing b.a./acre and b.a. increment/acre; (2) on any given site the b.a. increment that a fixed standing b.a. will produce decreases with increasing age; (3) any fraction of a stand (e.g. high-pruned stems or final crop trees) puts on b.a. increment directly proportional to its representation in the stand.

3195. LEMBCKE, G. Untersuchungen über die Beziehungen zwischen Krone und Zuwachs in gleichaltrigen Kiefernreinbeständen. [**The relations between crown and increment in pure even-aged stands of *Pinus sylvestris*.**] *Arch. Forstw.* 5 (5/6), 1956 (359–401). 40 refs. [G.g.]

Increment borings, d.b.h., and crown quality class (rated on tenths of total height, symmetry, and volume) were recorded for 2000 trees from 200 stands. The 6 crown classes are also grouped as *C, B* and *A*, containing respectively classes 1 and 2; 3; and 4, 5 and 6 (the best crowns). Stands included some normally stocked and some unusually heavily thinned 5 years previously. Conclusions from this material, supported in detail by statistical analysis with many regression equations, tables and

graphs, are as follows: (1) Crown class/d.b.h. is normally distributed, with the *C* and *B* groups distributed over the lower and middle diam. classes respectively and with the peak of the *A* group over the higher diameters. (2) *C* crowns are generally suppressed, and 80–90% of classes 3, 4 and 5 are among the dominants. (3) The diameter increment of stems within any crown class was practically independent of their diameter. (4) The variation coefficient of a stem's diameter p.a.i. from several stands of like yield-class and age (2 borings/tree) $\simeq$ 35–50%; stratified by crown classes this fell to 7–10%. (5) Larger crowns are associated with greater diameter increment than small, the difference being specially marked in young stands of high yield class. (6) Differences in mean diam. increment between crown classes were generally significant. (7) For a simple linear relation between crown class and diameter increment the correlation coefficient (r) varies between 0·30 and 0·60. (8) Diameter increment and b.a. increment of the single stem were generally higher in the heavily thinned stands (b.a. $<$ 0·7 of normal) than in normally stocked stands. The absolute diameter increment of single crown classes was about equal in either density of stocking but there was tendency for a relatively stronger reaction in poor crowns in the thinned stands. (9) B.a. increment seemed less dependent on crown class in the heavily thinned stands. (10) Mean b.a. increment of the *C*, *B* and *A* groups, where stands had basal areas 1·0–0·7 of normal were as 1 : 2 : 3. With the basal area stocking at $<$ 0·7 the ratio was 1 : 16 : 25. (11) The 3 forest regions concerned can be arranged in order of mean b.a. increment of the stem and this order is maintained in each crown class. (12) The region taking second place shows the b.a. increment differences of the crown classes most clearly. It is emphasized that many of these quantitative data are means and cannot be referred to an individual tree; but they illustrate the important influence of the crown on increment, a point to remember also for mixed crops.

3196. VYSKOT, M., and HUSTÝ, Z. Příspěvek k otázce vlivu umělé redukce na tloušťkový přírůst dubu. **[Effect of artificial reduction [of crown size and root spread] on the d.b.h. increment of Oak.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 29 (10), 1956 (745–70 + 1 dgm., 4 tbls.). 78 refs. [Cz.cz.russ.g.*russ.g.*]

The investigation was conducted in S. Moravia in a 60-year floodland Oak stand (site class I/II, stocking 296 cu.m./ha., alt. 170 m., heavy clay-loam soil), as a part of another investigation on the appearance of epicormics. Increment cores were taken at breast height on the N. side of (*a*) 40 stems that had had the lower $\frac{1}{3}$ of the crown removed, (*b*) 50 stems which had had one or two roots severed near the butt, and 15 controls. The results, analysed statistically, showed that both measures reduced d.b.h. increment but (*a*) much more so than (*b*).

3197. WALKER, N. **Juvenile development of a Cottonwood stand in Central Oklahoma.** *J. For.* 55 (1), 1957 (34–5).

In 1946 a $\frac{1}{3}$-acre plot was laid out in a naturally established stand of 2- to 3-year Cottonwood seedlings. Black Willow stems were removed by weeding. Its development over the 10-year period is described and d.b.h., b.a. increment and vol. (in cu. ft.)/acre are tabulated.

561. Increment in Height, Diameter, Basal Area, Form and Quality. Variations and Trends; Dendrochronology

See also Nos. 2525, 2614–5, 3202, 3206.

3198. WILHELMI, T. Untersuchungen mit einem schwedischen Mikrodendrometer über das Dickenwachstum an Bäumen. **[Studies of tree diameter growth with a Swedish microdendrometer.]** *Forstarchiv* 27 (11), 1956 (241–6). 9 refs. [G.g.]

In 1954 and 1955 weekly diameter measurements were taken in a park at Reinbek on 15 coniferous and broadleaved trees with a Swedish dial-gauge dendrometer [cf. *F.A.* 16 No. 2996 (*S. Karlberg*)]. The measurements disclosed that the growth curves of young Birch and Alder show an even rhythm, while those of some older trees, Spruce in particular, are subject to large fluctuations as a result of changes in turgescence. In most cases increment was greater on the N. side of the bole than on the S. side. Fluctuations were small in autumn, but during periods of continuous low temperatures ($-$ 4° to $-$ 7° C.) a decrease in diam. was registered. The Swedish microdendrometer was found to be completely satisfactory for physiological studies of diameter growth, its precision depending on careful handling. It can also be recommended for providing information on the influence of different thinning systems on the increment of individual trees. Suggested modifications, where hard wear is expected, are to replace the bottom plate of cast aluminium by one of brass, and to substitute a Kunzle precision dial for the Swedish one; the latter is equally sensitive but more subject to disturbance by weather.

3199. FRITTS, H. C. **Relations of radial growth of Beech (*Fagus grandifolia* Ehrh.) to some environmental factors in a central Ohio forest during 1954–55.** *Abstr. of thesis*, in *Dissert. Abstr.* 15 (8), 1956 (1323–4). O.R.S.

A new dendrograph, providing accurate records of daily changes in radius down to 1/10,000 in. was developed, and six were mounted on trees on sites varying from well drained Beech/Maple to poorly drained swamp forest. Growth over 2 years was found to be very highly correlated with both the daily weather pattern and the seasonal climatic regime. Differences in the growth regime of the 6 trees could be attributed to differences in the site, crown vigour or 'competition', and the influence of these on the effect of other environmental factors. When all these variables were accounted for, growth conformed to a highly predictable pattern.

3200. MESSERI, A. Relazioni fra clima ed accrescimento del tronco nel pino d'Aleppo. **[The relation between climate and stem growth in *Pinus halepensis*.]** *Nuovo G. bot. ital.* (*n.s.*) 60 (1/2), 1953 (251–86 + 6 photos). 18 refs. [It.e.] A.P.B.

A study was made of climatic data and growth rings of Aleppo Pine on the sandy shore of the Gulf of Taranto, distinguishing the effects of precipitation

from those of groundwater. For this species, and in these conditions, the presence of an accessible water-table had little, or a negative, effect on width of annual rings and sensitivity of tree-ring sequences to climatic variation. The curve of late-wood growth was found to agree more closely with the rainfall curve of the 'weather year' (December–November) than with that of the calendar year, and better still with the curves for the preceding autumn and winter months or of two 'weather years' (the current and preceding ones). Aleppo Pine apparently profits most from the winter rainfall, which accumulates in the soil because of the low temperatures. A lower rainfall well distributed throughout the growing season leads to the formation of a wider growth ring than a heavier rainfall irregularly distributed. Other factors affecting ring width are the duration and degree of evapotranspiration deficit (index of aridity) during the summer, and the temperature in autumn when the index of aridity decreases. This decrease in index of aridity is caused by both increase in rainfall and decrease in temperature, and there seems to be a critical value for both these factors at which cambial activity is resumed.

562. Volume Increment

See also No. 3224.

3201. STEPHENSON, G. K. **Mortality in the woodpile.** *Sth. Lumberm.* 193 (2417—Christmas No.), 1956 (220–1).

In analysing the factors involved in the fall of c.a.i. on Texas sample plots in the 3rd quinquennium since their establishment, the author particularly investigates the mortality, which had risen from 25 to 76 bd. ft./acre. Much of this is attributed directly or indirectly to drought. It was heaviest in the years immediately after logging, when trees damaged by logging succumbed more easily to beetle attack (chiefly *Dendroctonus terebrans*). Windthrow also occurred in 3 years out of every 5, and ice storms hit the area twice in 15 years, damaging mostly small trees.

3202. RICHTER, A., GROSSMANN, H., and THIELE, H. Zur Frage der Zuwachsermittlung mit Hilfe von Bohrspanproben. **[The determination of increment by sampling with a borer.]** *Arch. Forstw.* 5 (1/2), 1956 (104–25). 15 refs. [G.g.]

Details the development, the mathematical bases, and calculation of error for the 'Eberswalde increment inventory method' with instructions on field sampling and office calculations and booking, with a worked example. Increment calculation is linked with growing-stock volume, the data being collected simultaneously with the special enumerations undertaken [cf. *F.A.* 16 No. 3257]. The same 'forest height-tariff' [see *F.A.* 17 No. 3099] is used. The extra cost of collecting the increment data is about DM.0·6/wooded ha. Increment cores are taken on the circular-plot trees selected for height determination, and from these the mean ring widths of the last 10 years' growth at b.h. are booked. For the determination of increment by diameter classes, three steps in calculation are detailed, the reduced enumeration volumes being first tabulated by species or species-groups, diameter classes, and sub-compartments. These steps involve the determination of (*a*) the mean increment-tariff groups by weighting for the volumes represented [cf. *F.A.* 17 No. 3099] which leads to one of 3 columns of a simplified (grouped) increment-coefficient table, based on a modification of Schneider's formula, from which this coefficient can be read for each diameter class and separately for soft- and hardwoods; (*b*) the weighted mean radial increments (from the cores) for each diameter class; and (*c*) the volume increment % and absolute volume increment o.b. The multiplication of the coefficients in (*a*) with the increment in (*b*) gives for each diameter class its volume increment %, and the latter multiplied by the corresponding growing stock volume of the class gives the absolute volume increment.

565. Sample-Plot Technique

See No. 3203.

566. Yield Tables and Their Construction

See also Nos. 2681, 3163.

3203. MATHAUDA, G. S. **Sample plots and yield tables.** *Proc. 8th silv. Conf., Dehra Dun 1951* Part 2, 1956 (8–16). 14 refs.

Outlines the history of sample-plot work in India and describes the present position; lists, with literature references, the Indian species for which yield tables have been compiled; suggests work that now needs doing, and gives some directions for sample-plot technique in accordance with the Silvicultural Research Code, with particular reference to thinning.

3204. SUDARMO, M. K. Tabel-tegakan sementara dari *Agathis loranthifolia* Salisb. (= *A. alba*). **[Preliminary yield table for *A. alba*.]** *Commun. For. Res. Inst., Bogor* No. 52, 1956. pp. 8 + 1 tbl. [Jav.e.]

3205. LAAR, A. VAN. **Stand development and stem form of the Douglas Fir (*Pseudotsuga taxifolia* Britt.) in the Netherlands.** *Netherlands Journal of Agricultural Science, Wageningen* 2 (4), 1954 (265–72). 7 refs. [E.e.] E.M.B.

Increment measurements on 65 heavily thinned trial plantations are used to show the development of stands in the Netherlands up to 30 years. Yields compare satisfactorily with Kanzow's yield tables for Prussia (1937), but are considerably below those of Grandjean and Soest [cf. *F.A.* 15 No. 567]. A taper table was derived from 801 trees measured after felling. At heights below 20 m. the stem forms of Douglas Fir and Japanese Larch, as shown in figures obtained by Schober [see *F.A.* 15 No. 1656], correspond closely with each other, but above 20 m. the former tapers more rapidly.

568. Other Mensurational Studies of Stand Constitution and Changes Therein. Distribution of Growth by Tree Classes etc.

3206. JURČA, J. O výškovém rozvrstvení mlazin. **[Height distribution in young stands.]** *Sborn. čsl. Akad. zeměd. (Lesn.)* 29 (11), 1956 (799–812). 7 refs. [Cz.cz.russ.e.g.*russ.e.g.*]

Results of measurements (height, b.a., and area of crown projection of 662 trees, and height only of 14,785 trees, all 15–20 years old, in stands preponderantly of broadleaved species, mainly Hornbeam) showed that: (1) stem frequency decreases steadily from the lowest height (50 cm.) to the highest (ca. 10 m.); (2) maximum b.a. and crown-projection area (c.p.a.) is at about 5 m., the frequency curves being almost identical for b.a. and c.p.a.

569. Increment; Development and Structure of Stands: Miscellaneous

See also No. 3345.

3207. OVINGTON, J. D., and PEARSALL, W. H. **Production ecology. II. Estimates of average production by trees.** *Oikos* 7 (2), 1956 (202–3). 2 refs.

Studies were made on 20- to 22-year plantations at Bedgebury and West Tofts and 40- to 47-year plantations at Abbotswood. At all 3 localities there are several plots of different species, and 1–2 trees of average height and girth were felled in late summer, samples from the canopy and bole were dried and weighed, and the oven-dry weights of the individual trees calculated. The estimated average yields of dry matter (kg./ha./p.a.) are tabulated for 14 species. An allowance was made for thinnings, where they had been made. Evergreen conifers have a significantly higher annual yield (averaging ca. 9900 kg./ha.) than deciduous broadleaved species (ca. 4200 kg./ha.). The deciduous Larches are intermediate. The greater production of evergreens may be associated with their ability to photosynthesize during suitable periods in the winter months. Results must be interpreted with caution, as the plantations were established from seedlings and the m.a.i. of dry matter from the time of planting is modified by the period necessary to develop extensive canopy and root systems.

3208. HIRAI, S. **Distribution of bulk density of wood within the stem of *Pinus strobus* Linn. in Hokkaido and its weight growth.** *Transactions of the 63rd Meeting of the Japanese Forestry Society, Meguro, Tokyo* 1954 (261–3). [Jap.?] From *abstr.* in *Rec. Res. Fac. Agric. Univ. Tokyo* No. 5, 1956 (73). [E.]

Distribution of basic density (oven-dry wt./max. vol.) was measured in five 39-year stems from a plantation, and weight increment of individuals and weight yield of the stand were calculated. [No results are given in the abstract.]

58. Surveying and Mapping. Aerial Surveys

See also Nos. 2429, 3183, 3582.

3209. KRISHNASWAMY, V. S. **Forest surveys and forest maps.** *Proc. 8th silv. Conf., Dehra Dun 1951* Part 2, 1956 (336–7).

A brief resumé of the answers to a questionnaire sent to the various Indian forest departments to determine the state of existing maps and surveys.

3210. KADAMBI, K. **Suggestion for the preparation of maps for unmapped and inadequately mapped forest areas.** *Proc. 8th silv. Conf., Dehra Dun 1951* Part 2, 1956 (334–6).

Since the Survey of India obviously has not the resources to cover the unmapped forest areas, it is suggested that small field-survey units should be established in each state, to produce forest topographical maps on a scale of 4 in./mile, rapidly and cheaply. Such parties, consisting of half a dozen each of plane-tablers and draughtsmen and a trained officer, should be able to survey 250 sq. miles a year.

3211. SAHAI, R. **Preparation of enumeration map of a forest.** *Proc. 8th silv. Conf., Dehra Dun 1951* Part 2, 1956 (346–7). 1 ref.

Describes a method of transferring data from partial enumerations to base maps, by the use of a grid giving 100 sq. chains, on which symbols are plotted showing broad stocking classes, and the map finally coloured to show the same classes.

3212. WINKWORTH, A. V. **A comparison of methods employed in measuring area.** *Res. Note U.B.C. For. Club.* No. 15, 1956. pp. 6.

The areas of 9 figures of different shapes were measured on aerial photos and on maps, using (1) 10-dot grid, (2) 20-dot grid, (3) 40-dot grid, (4) transects 0·5 in. apart, (5) transects 1 in. apart, and (6) a polar planimeter. For rectilinear figures there is no significant difference between the different methods, but for irregular curvilinear lines (3) and (5) are significantly less accurate than the others. Method (1) is very slightly less accurate than (2), (4) or (6), but much more rapid.

3213. SIMS, W. G., and HALL, N. **Some requirements for air photo interpretation in Australia.** *Aust. For.* 19 (2), 1955 (121–35). 6 refs.

A general discussion of the principles of interpretation, a review of the equipment at present in use in Australia, and suggestions for the selection and training of photo-interpreters.

3214. MACCONNELL, W. P., and GARVIN, L. E. **Cover mapping a state from aerial photographs.** *Photogramm. Engng.* 22 (4), 1956 (702–7). L.S.

Vegetation maps are very desirable for game management, and would be invaluable in determining a wildlife management policy for a state. When good aerial photographs of Massachusetts were taken in 1951 and 1952, it was recognized that these offered a good opportunity to map the forests, open land, and wet lands of the entire state. In the fall of 1953 such a project was initiated by the Massachusetts Cooperative Wildlife Research Unit. A vegetation classification system was evolved which permitted the separation of vegetation on the aerial photographs' consistently and accurately under all conditions. Photographs were interpreted and annotated in India ink; the interpreted information was transferred to U.S.G.S. maps at a scale of 2 in. = 1 mile; these maps were reproduced in quantity in black-and-white; the originals were coloured; areas were determined and tabulated by cover types for towns, U.S.G.S. sheets, counties, and the state. To a map showing both planimetric and topographic detail, the vegetation has been added. These maps, coupled with area statistics of the cover types, constitute an important tool in game management. Both the maps and the statistics should be of considerable use to foresters,

agricultural economists, soil conservationists, town and regional planners, and others interested in large land areas in Massachusetts. Over 80% of the state has been completed and black-and-white map reproductions are available in quantity. *From authors' summary.*

3215. POWELL, L. W. **Problems of a forest inventory on scattered ownership using aerial photographs.** *Northw. Sci.* 29 (4), 1955 (151–4). L.S.

Describes the inventory of 140,000 acres of forest land (state-owned) in N.W. Oregon, including the processing of aerial photographs, delineation of ownership on them, type mapping, and estimation of volume per acre.

3216. TOMAŠEGOVIĆ, Z. O pouzdanosti aerofototaksacije za neke dendrometrijske potrebe šumskog gospodarstva. **[Reliability of aerial photogrammetry for some mensurational needs in forest management.]** *Glasn. šumske Pokuse* No. 12, 1956 (167–224 + 3 photos, 1 tbl.). 25 refs. [Croat.croat. e.*e.*]

The author reviews the photogrammetric methods so far used for evaluation of the growing stock, citing Neumann (*Beitrag zur Vorratsermittlung aus Luftmessbildern*, a thesis, date and place not specified), Spurr [see *F.A.* 10 No. 2336] and Wodera [see *F.A.* 10 No. 2337], and concluding that, without mean stand-height data, all these methods are very unreliable. His own observations in Jugoslavia (1951–52) for (1) Zagrebačka Gora mountain (stands with (*a*) open, and (*b*) closed canopies and also (*c*) isolated stems), and (2) the Plitvica Lakes (stands with (*d*) an open canopy), showed that in (*c*) and (*d*) the correlation between crown diameter (c.d.) and d.b.h. is highly significant, in (*a*) less so, and in (*b*) very low. In (*b*), linear correlation is permissible for each separate plot but the numerical coefficients vary greatly with local conditions. Such differences, though much smaller, can also be found between plots in other types of stand. The author concludes that the present trend in forest aerial photogrammetry is towards taking site characteristics (e.g. as expressed by the mean stand height) into consideration in addition to c.d., because the c.d./d.b.h. correlation cannot be established at a desirable fiducial level from c.d. alone. Once mean stand height is taken as the second variable, there is no need for introducing age as another variable. The possibility of attaining better correlation between other magnitudes (e.g. crown volume and stem mid-diameter) is discussed. The author advocates taking photographs about noon, and not in the morning when the shadows are long. Only photographs from morning flights were available for the author's studies. Using these and volume tables (cf. Wodera, *loc. cit.*), he found that the mean stem volume can be determined with a mean error between $\pm$ 13% and $\pm$ 40%, depending on d.b.h. and stem height. The error will be less for larger and more uniform forest complexes, when a larger sample population will be available.

3217. DILWORTH, J. R. **The use of aerial photographs in cruising second-growth Douglas-Fir stands.** *Abstr. of thesis*, in *Dissert. Abstr.* 16 (9), 1956 (1549). O.R.S.

Most of the data were collected on ninety $\frac{1}{6}$-acre plots in stands of the McDonald Forest, Willamette Valley, Ore., and 320 sample-tree measurements from N.W. Oregon were also used. The relationship of visible crown diameter (v.c.d.) to d.b.h. gave rectilinear regression lines. Effects of other factors on the relationship were: (1) The addition of tree height as a second independent variable increased the accuracy of d.b.h. estimation. (2) As site quality decreased, v.c.d. increased for a given d.b.h. (3) Increase of stand density over 70% had no appreciable effect on the v.c.d./d.b.h. relationship, but in medium and poorly stocked stands, v.c.d. increased with decreasing density for a given d.b.h. (4) Geographical location appeared to have a limited influence on the v.c.d./d.b.h. relationship Local and standard photo-volume tables were derived and tested. A photo-cruise of the 70 plots, using a standard photo-volume table, gave an aggregate difference of $-$ 2·8% and a standard error of 13·4%, excluding any correction for volume of trees not visible on the photographs. The average stem-count per photo-plot showed an average difference of + 1·0 $\pm$ 2·02 trees from the field plot. A comparison of the average v.c.d. per plot as determined by field and photo measurements showed the estimates from the latter to have an average deviation of $-$ 0·5 $\pm$ 1·84 ft. Conclusions are that the method is satisfactory at normal standards of accuracy.

3218. ALLISON, G. W. **The accuracy of tree height measurements on various qualities of aerial photographs.** *For. Chron.* 32 (4), 1956 (444–50), 2 refs.

Various qualities of aerial photograph were tested for measurement of tree heights. In all, 17 sets of photographs, each differing in one or more respects, were used. It was found that underestimation of tree height increased, and individual tree determinations became less precise, with increased flying height and/or shorter focal length and/or greater degree of enlargement. The differences between heights measured on photographs and on the ground are apparently correlated with tree height, being greater for taller trees. In any job concerned with actual height, it would therefore be necessary to apply a variable correction factor—smaller for short trees, larger for tall ones. In problems concerned with absolute average-height determinations, an operator must establish a 'local' correction curve for each kind of photography in which he works. In problems concerned only with relative average-height determinations, no correction curves are necessary, but about twice as much work is required on poor photography to determine equally precise averages.

3219. AXELSON, H. **Effect of photo scale on the use of aerial photographs in Swedish forestry.** *Norrlands SkogsvFörb. Tidskr.* 1956 (3), (255–92). 8 refs. [E.e.sw.]

Photographs were taken in three districts at different heights, corresponding to scales 1 : 16,000,

1 : 26,000, and 1 : 33,000. Investigations on sources of error in measurements using mirror stereoscopes showed that a tilted camera axis may cause considerable error in height measurement. The difference in scale appeared to have little effect on accuracy of estimation of tree height, mean stand height, density, timber supply, tree species or tree age. The scale 1 : 33,000 would be adequate for normal forestry use, but for practical reasons, e.g. size of enlargement, a scale of at least 1 : 30,000 is desirable.

3220. Tomsa, K. Nomogram pro výpočet korekce příčného sklonu leteckých snímků. [**Nomogram for evaluating corrections for tilt effects in aerial photographs.**] *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 29 (11), 1956 (793–8). 5 refs. [Cz.cz.russ.g.*russ.g.*]

3221. Hardy, W. U. **Air photo overlays.** *Tech. Note For. Br. Can.* No. 46, 1956. pp. 9 + 5 dgms. 5 refs.

Notes on the use of tree-height and perspective grids, pole scales, height crown scales etc.

6. FOREST MANAGEMENT. BUSINESS ECONOMICS OF FORESTRY. ADMINISTRATION AND ORGANIZATION OF FOREST ENTERPRISES

See also No. 3601.

61. Forest Management: General, Theory and Principles

3222. Bickford, C. A., *et al.* **Stocking, normality and measurement of stand density.** *J. For.* 55 (2), 1957 (99–104). 36 refs.

The report of the Committee on Stocking of the Society of American Foresters. Existing concepts of stocking are examined in relation to each other and the normal forest, and the advantages and disadvantages of various measures of density are discussed. The report stresses the need for a research programme to determine the stand density that gives the maximum yield for each of the major forest types, and to compare methods of measuring the quantity and quality of the increment and yield.

62. Working Plans. Annual or Periodic Yield. Yield Regulation

See also Nos. 2678, 2680–1.

3223. Lehmann, J. Das Jahr in der praktischen Forsteinrichtung. 1.–9. Folge. [**Forest management through the year. Parts 1–9.**] *Forst u. Jagd* 4 (3; 5–12), 1954 (91–4; 177–80; 214–5; 253–4; 300–1; 328–30; 371–3; 419–21; 449–51). [G.]

A description, for the practical forester, of the successive stages in working-plan preparation, applying the Provisional Management Instructions for E. Germany, issued in 1953.

3224. Reade, M. G. **Sustained yield from selection forest.** *Quart. J. For.* 51 (1), 1957 (51–62 + 3 photos). 3 refs.

Brief details are given of the application of the *méthode du contrôle* in the author's private Chiltern woods. In order to be able to make comparisons between the yields realizable under different systems of management, the author has developed an increment formula by means of which yield-table and similar data can be re-computed in selection-forest form. The formula is

$$I = \frac{2 \times V}{QG \times TP} + \frac{BA}{TH}$$

where I = c.a.i. in cu. ft. o.b., V = volume of tree in cu. ft. o.b., QG = q.g.b.h. in inches, BA = basal area of tree in sq. ft. o.b., TP = number of years required to grow 1 in. q.g.b.h., and TH = number of years required to grow 1 ft. of form height (vol./ha.). The derivation of this formula is shown in an appendix. Typical sustained yields for slightly idealized Chiltern and Swiss selection forests are compared, together with a preliminary estimate of the yield of mixed hardwood/conifer 'irregular' forest under Chiltern conditions. The Swiss sustained yield is further compared with even-aged yields for the same species as given by Mar Moller's Danish yield tables. The conclusions give no clear victory to the proponents of any particular system, but indicate the approximate proportion of the total yield that must be cut out as thinnings, whatever the system. There is prima facie evidence that the thinnings yield may be even greater in selection forest than in even-aged forest. *From author's summary.*

3225. Woodward, H. R. **Forest management versus recreation management.** *Amer. Forests* 63 (1), 1957 (32–3, 51–3). 3 refs.

From experiences in the Custer State Park, S. Dakota, it is argued that the best method of preserving forest for parks is through sustained-yield management supported by measures against fire, insects and disease. Total neglect will lead to overmature stands and heavy annual losses from disease and insects.

3226. Prasad, B. N. **The standard in the preparation of first working plans of the private forests of Bihar, recently taken over under the Bihar private forests act of 1947.** *Proc. 8th silv. Conf., Dehra Dun 1951*, Part 2, 1956 (500–3).

Describes in considerable detail the problems facing the small Bihar Forest Department (estate 2606 sq. miles) when the 1947 Act gave it control over 10,000 sq. miles of private forest (predominantly *Shorea robusta*) half-ruined, over-grazed and overburdened with rights of use, and largely inaccessible. The main features of the rehabilitation working plans are explained, including measures for stock-mapping, strip enumerations, grazing control, demarcation of ca. 100,000 miles of artificial boundary lines with the help of planted aloes, and counter-erosion work.

64. Forestry as a Business: General

See also No. 3236.

3227. CONDER, E. M. **Problems of forestry in industrial areas.** *Quart. J. For.* 51 (1), 1957 (38–45).

The main difficulties with which forestry in industrial areas is faced are discussed—atmospheric pollution, the keen demand for land, the limited choice of species, the shortage of labour, and the liability of the crop to many forms of damage, against which must be set a keen demand for the produce and, generally, comparatively easy access to markets. Reference is also made to the planting of open-cast mining sites and coal tips, and to the extensive work that has been done on old ironstone workings in Northamptonshire. The importance of amenity and the need to educate the general public to appreciate the principles of good forestry are also considered. *Author's abstract.*

65. Special Business Problems of Timber-Growing. Calculation of Costs and Profitability. Valuation

See also Nos. 2679, 2682, 2685, 2719, 2730, 2734, 2804, 2815, 2837, 2839, 2842, 2846–8, 2858, 2863, 3572.

3228. HEIKINHEIMO, L. Britannian metsätalouden kustannuksista. **[Costs in British forestry.]** *Metsät. Aikak.* 1956 (10), (323–5). [Fi.e.]

Discusses, on the basis of data from S. Scotland, the causes of the low profits obtained. The main factors appear to be the high costs, as compared with Finland, of felling, primary conversion, transport, and overheads. Stumpage prices, though high by Finnish standards, are insufficient to cover high costs of afforestation and regeneration. *From author's summary.*

3229. HILEY, W. E. **Economics of plantations.** Faber & Faber Ltd., London. 1956. pp. 216. 35 refs. Price £1 5*s*.

The author's aim in this book 'is to convince students that some of the accepted practices of forestry are uneconomic, and that the study of forest economics can lead towards a noteworthy advance in the productivity of our [sc. British forestry] industry'. Particular emphasis is laid on the importance of soil fertility and methods of thinning when considering the economics of plantations. The book contains the following chapters: interest on capital; the Faustmann formula; costs in forestry; the income from plantations; the economics of thinning; the rotation; site and species; a policy for thinning grades and rotations in Britain; the whole forest. These are two appendices—(1) compound interest table, (2) multipliers for use with the Faustmann formula.

3230. DAVIS, P. W., and GRANT, G. C. **Survey of private forestry costs in Scotland. Second annual report for forest years 1951–52 and 1952–3.** Department of Forestry, University of Aberdeen. 1954. pp. 56 + 1 map. Price 5*s*. [Cf. *F.A.* 17 No. 1883.]

3231. DAVIS, P. W., and GRANT, G. C. **Survey of private forestry costs in Scotland. Fourth Annual Report for forest years 1953–54 and 1954–55.** Department of Forestry, University of Aberdeen. 1956. pp. 74. Price 6*s*. 6*d*. [Cf. *F.A.* 17 No. 1883.]

3232. SAMPAIO, J. SALAZAR. Um caso particular de exploração intensiva de pinhal bravo—estimativa dos seus resultados financeiros. **[A particular case of intensive exploitation of a *Pinus pinaster* stand—an estimate of its financial returns.]** *Estud. Inform. Serv. flor. aqüic. Portugal* No. 71–G3, 1956. pp. 39 + 5 tbls. [Port.port.] Limited distribution.

A study of a particular type of *Pinus pinaster* stand established by sowing on podzolized sands between Santiago do Cacém and Sines. Estimates are presented of the cost of establishment (lasting over a period of 9 years), costs and returns from resin tapping, and the final yield at 30 years.

3233. CHAPPELLE, D. E. **Thinning costs in planted Slash Pine.** *Sth. Lumberm.* 193 (2417—Christmas No.), 1956 (246–7).

Selective thinning of a 15-year plantation, spaced 8 × 8 ft., removing 6·50 cords/acre of an original 20·74, took 6·12 man-hours/cord, of which 0·30 hours were spent on marking. Mechanical, i.e. unselective, removal of alternate rows, taking ca. one-half of an original 25 cords/acre, required one hour less per cord.

3234. RUDRA, A. B. **The expectation value of the soil.** *Indian For.* 83 (2), 1957 (85–90). 2 refs.

The error inherent in estimating soil expectation value by the Faustmann formula is pointed out and the correct method indicated. The effect of distributing the annual maintenance factor, in time, after the manner of Petrini is discussed. Petrini has shown that 'with a rational distribution of overhead costs over various developmental stages in the rotation, the essential administration costs capital is decreased to half of that which the Faustmann formula involves'. The nature of the reduction factor is discussed; its effects on the financial rotation and financial yield, do not seem to be marked. *From author's summary.*

3235. MELZER, E. Verfahren zur Ermittlung vergleichbarer Werte für den Austausch forstlicher Grundstücke. **[A method for computing comparable exchange values for forest land.]** *Forst u. Jagd* 4 (5), 1954 (165–7). [G.]

Gives formulae and supporting tables for computing relative values at ages below maturity, including both mixed and uneven-aged forests.

3236. ZIEGER, E. Grundlagen der Ausscheidung technologisch begründeter Produktionszieltypen. **[Distinguishing sites best suited to types of management based on wood quality.]** *Arch. Forstw.* 5 (5/6), 1956 (313–28). 5 refs. [G.g.]

Demand in developed countries for quality timber of > 40 cm. diameter will stay steady, that for wood < 20 cm. will rise substantially (chemical industries) and softwoods will keep their lead. The correct use of sites to obtain higher and more uniform quality in all assortments will be most important. For strength and suitability for pulpwood, the dry bulk density and dry-weight/green volume

respectively are valuable indicators. Arranged in order of increasingly easy recognition but of decreasing technological significance, the following criteria of wood quality in Spruce, Pine, Larch, Oak etc. are discussed in relation to site effect: ring width in its opposing and irregular association with weight in hardwoods and softwoods; taper, in its effect on outturn and weight; knottiness; twisted fibre; and external defects.

66. Costing of Logging Operations

See also Nos. 2679, 2928, 2932, 3228, 3246.

3237. Canal, M. La route forestière d'Osséja. **[The forest road of Osséja.]** *Bulletin de la Fédération Française d'Économie Alpestre, Grenoble* (*n.s.*) No. 6, 1956 (40–1). [F.]

A short account of costs, and influence on financial returns, of a road built in this communal forest to facilitate extraction. The work was all done by bulldozer, and the total cost of 23 km. of road was 33,720,000 francs.

3238. Müller, O. Finanzielle Auswirkung der Walderschliessung. **[The financial results of opening up a forest.]** *Schweiz. Z. Forstw.* 108 (2), 1957 (121–6). [G.]

Describes the rehabilitation of the finances of the commune of Courtelary (Neuchâtel) which, largely through mismanagement of its 480 ha. of forest, had been put under a receiver-administrator. The expenditure of nearly Fr.500,000 over 20 years on some 15 km. of forest road resulted in an increase in net returns of ca. Fr.50,000 p.a., due to raising the proportion of wood other than fuel from ca. 30% to 60–70%, plus savings in transport.

3239. Arvidsson, B. Vägkostnaderna i skogsbrukets transportanläggning. **[Costs of roads in planning forest transport.]** *Repr.* from *Svenska Lantarbetsgivareföreningarnas Tidskrift* [*Stockholm*] 1955 (12). pp. 5. [Sw.]

Data of costs of road-building and maintenance for different types of road, costs of horse, tractor and lorry transport, and costs of transport for different road spacings are shown in tables and graphs, and are discussed.

67. Assessment of Financial Results; Bookkeeping and Accountancy; Business Statistics; Short-Term Planning and Financing

See also No. 3243.

3240. Katoh, T. **[Profit and loss of the National Forest in Japan.]** *For. [industr.] Econ., Tokyo* 9 (11), 1956 (20–2). [Jap.]

The author compares the net profits from State forestry for the years 1953 to 1955 with those from factories, coal mining, railways (State and private), and electricity undertakings, all of which show far higher returns (up to 8·7%) against a maximum of 0·95% for State forestry. The reasons for this, residing largely in the primitive nature of the forest industry, are briefly discussed.

3241. Lemmel, H. Forstliche Vermögens- und Erfolgsrechnung. **[Capital and profit-and-loss accounting in forestry.]** *SchrReihe forstl. Fak. Univ. Göttingen* No. 17, 1956. pp. 74 + 1 schedule. 72 refs. [G.]

Discusses the importance and merits of financial accounting systems, both of state and business type, and valuation principles for growing stock and increment, favouring a system based on expectation values and adjustment of prices by index-figures. An example is given in the form of the annual report, profit-and-loss account, balance sheet, and complete decimally arranged schedule of accounts of the Instruction district of Kattenbühl.

68. Administration and Organization of Forest Enterprises

681. National (Federal, State) Forest Services and Administration

See also No. 3594.

3242. Hughes, J. F. **The utilisation division of the forest department, Tanganyika Territory. I.** *Emp. For. Rev.* 36 (1), 1957 (67–79).

Outlines its aims and functions.

683. Office Organization

3243. Kennel, H. Von der Verlohnungsarbeit in den Forstbetrieben. **[Pay-office work in forest enterprises.]** *Forstarchiv* 27 (5), 1956 (104–9). [G.]

Shows how the use of accounting and calculating machines can save labour in drawing up wage sheets.

684. Labour Management

3244. **How a State [Washington, U.S.A.] rehabilitates its forests and men.** *Lumberm.* 84 (1), 1957 (36–41).

Describes the organization and work of two 65-parole-prisoner camps, recently set up—(1) a permanent camp at Larch Mountain, the main task of which is the rehabilitation of 110,000 acres of the 260,000 acre Yakolt burn (1902), and (2) the portable Clallam County Camp. At (1) priority is given to making 63,000 acres safe from fire by snag felling and making firebreaks and access roads. At (2) roadbuilding is being combined with thinning, sowing and planting. For the current biennium $810,000 has been voted for the two camps, a considerable part of this being capital outlay. Similar use of prisoner and corrective-school labour in California and Oregon is briefly noticed.

686. Planning and Organization of Buildings, Transport Installations (Roads etc.)

See also Nos. 3237–9.

3245. Pechmann, H. von, Bernhart, A., and Kammerer, I. Der Entwurf eines Bringungsnetzes für den Distrikt Albertsbach im bayrischen Forstamt Kreuth als Beispiel einer generellen Erschliessungsplanung im Hochgebirge. **[Project of a transport network for the Albertsbach District in the Kreuth Forest District, Bavaria, as an example of a general plan for opening up the forest in mountainous districts.]** *Forstwiss. Cbl.* 75 (5/6), 1956 (129–48). 9 refs. [G.]

The plan provides for a combination of road-building and aerial-cableway installations and includes an estimate of costs.

3246. MATYÁŠ, K. Řešení ekonomického situování tras lesních cest metodou grafické statiky. **[Solution of the economic planning of forest roads by a method based on graphical statics.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 29 (4), 1956 (277–302). [Cz.cz.russ.g.*russ.g.*]

The method suggested aims not at creating ready access to the largest possible forest area, but to the largest possible timber volume; areas having the largest amount of extractable timber are then the decisive factors in planning forest roads. By determining the 'centroid' of a given area and using the idea of a 'pressure' exerted on a road by this timber volume (whether to be felled or already felled), the author applies the principles of graphical statics to determine the theoretically optimum siting of the road, from which departures will of course have to be made according to the configuration of the ground. Several characteristic problems are solved in illustration.

7. MARKETING. ECONOMICS OF TRANSPORT AND THE WOOD INDUSTRIES

72. The Quantitative Aspects of Marketing. Demand, Consumption and Supply

See also No. 3579.

3247. **Yearbook of forest products statistics 1956.** FAO, Rome. 1956. pp. 170. [E.F.Span.]

Includes information from more than 20 countries for 1955. Coverage, particularly of Latin America, has been greatly improved during 1955.

3248. WEDDING, K. U. Probleme des Faserholzmarktes. **[Problems of the [W. German] pulpwood market.]** *Holz-Zbl.* 83 (25), 1957 (313–5). 4 refs. [G.]

Discusses the interrelations of the markets for fuelwood, pulpwood, mining timber, sawtimber etc. (involving frequent use of low-quality sawtimber for pulping), actual and potential yields of small softwoods, industrial requirements, and the implications for forestry of a situation where the latter greatly exceed the former.

3249. Les besoins en bois du Proche-Orient. **[The timber requirements of the Near East.]** *Rev. int. Bois* No. 223, 1956 (219–22); No. 224, 1957 (5–11). [F.]

A report prepared by FAO, representing a first attempt at evaluating the present production and consumption of wood and probable future trends.

73. Prices

See also No. 3572.

3250. SMITH, J. T. **Timber trends and price prospects.** *Scot. For.* 11 (1), 1957 (29–33).

Analyses and discusses some of the trends in British home-produced timber as displayed in the T.D.A. Yearbook of Timber Statistics.

3251. KNIGGE, W. Die Neufassung des Messzahlsystems. **[A revision of the system of index numbers [for round timber].]** *Forstarchiv* 27 (10), 1956 (226–8). 11 refs. [G.]

The advantages and disadvantages of a system of index numbers for round timber assortments are discussed, and ways of modernizing the present system are examined. A revised system may be based on an analysis of market prices at different types of sale or on analysis of costs. Arguments for and against each method are presented. In a revision of the present system, which is to take place as soon as possible, it may be expected that: (1) as index numbers will be adjusted to market prices, index numbers for coniferous and Beech wood will rise considerably; (2) index numbers for the most valuable timber will be made uniform when it is in comparable lots for sale but sorted by different methods; (3) there will be only 3 index numbers for hardwood logs.

74. Trade Policy

3252. LEMMEL, H. Forstliche Holzmarktpolitik. **[The forestry aspects of timber market policies.]** *SchrReihe forstl. Fak. Univ. Göttingen* No. 15, 1956. pp. 125. 89 refs. [G.]

Describes the structure of the German market, as far as possible, for the whole of Germany (1937 frontiers, hence largely on pre-war statistics, supplemented by more recent figures for the Federal Republic). On the supply side, the preponderant position of the state forests, on the demand side, that of an over-developed sawmill industry are stressed. Regional differences, and differences between the markets for various categories of wood, e.g. a practically closed market for sawtimber and an open one for mining timber with ample import facilities, are discussed. Changes in policy from early Weimar days and the strict control of output and prices of the totalitarian regime to the gradual re-introduction of a free market are sketched. Various means of implementing market policy, with particular reference to the role of the state as chief producer and important consumer, and the effect of timber prices on the development of substitute materials, are discussed.

3253. ROTEN, F. Le problème de bois d'affouage en Valais. **[The fuelwood problem in the Canton of Valais.]** *Forêt, Neuchâtel* 10 (6), 1957 (127–30). [F.]

Describes a scheme, organized with the help of Swiss pulp mills, by which some of the coniferous wood suitable for pulping, until recently used mostly for fuel by the owners of communal forests managed largely to supply their direct wants, is sold to the mills, and some of the previously surplus Beech fuelwood from Jura hardwood forests purchased instead.

3254. Das Holz in der Wirtschaftsintegration. **[Wood in the integrated [European] economy.]** *Holz-Kurier, Wien* 12 (11), 1957 (1–4). [G.]

Discusses the implications of the proposed common market and free-trade area for Austria's timber trade and forest-products industries, and concludes that the raw-materials basis of the latter would need to be safeguarded if Austria joined the free-trade area, the members of which would mostly be wood importers.

78. Economics of Transport

3255. Mantel, K. Probleme der deutschen Verkehrspolitik in ihrer Auswirkung auf die Forst- u. Holzwirtschaft. **[Problems of German transport policy as they affect forestry and the wood industry.]** *Forsch. u. Berat. (Forstw.) Landesaussch. landw. Forsch. Landes Nordrhein-Westfalen* No. 2, 1956 (67–71). [G.]

Gives some data on the relative proportions of water, rail and road transport and on rail freight rates for various assortments, loading costs, etc., and discusses the likely effect on general price levels, siting of mills, etc. of proposals for diverting long-distance traffic to the railways.

79. Economics of the Forest Products Industries

See also Nos. 3398–9, 3493, 3515.

3256. **[Capital investment, new equipment and pulp and paper production.]** *Pulp Paper Mag. Can.* 57 (13), 1956 (96–113).

Four articles covering a statistical review of the development of the Canadian pulp and paper industry, 1948–56, and (in detail) the production of 1954, 1955 and the record year 1956 (9 months); with notes on the progress of 38 companies in their expansion programmes.

3257. Skok, R. A., and Beazley, R. I. **The charcoal production and marketing situation in the United States with reference to Minnesota.** University of Minnesota Agricultural Experiment Station, St. Paul, Minn. 1956. pp. 42. 45 refs.

3258. **Sawmill trading profits.** *Timb. Tr. J.* 220 (4202), 1957 (63).

Reports a House of Lords judgment, dismissing the appeal of H. R. Hood Bars (trading as the Killiechronan Saw Mills and Joinery Works, Isle of Mull) and confirming that money paid (£49,150) for standing timber was not a permissible deduction in computing a sawmill proprietor's trading profits for the purpose of ascertaining his liability to income tax.

3259. Coolidge, L. D., and Pfeiffer, J. R. **Cost estimating for wood industries.** *Inform. Circ. Ore. For. Prod. Lab.* No. 9, 1956. pp. 78. 88 refs.

Deals mainly with the costing of capital outlay, output, and maintenance of equipment for wood industries, illustrated by the example of Lodgepole Pine hardboard.

3260. Benson, R. J. **Costing in the timber industry.** *Aust. Timb. J.* 22 (12), 1957 (135–44).

Discusses the operations and their costing and gives 9 account forms and a costing flow-chart.

3261. Fassnacht, D. **Boards or chips?** *Sth. Lumberm.* 193 (2417—Christmas No.), 1956 (243–4).

Discusses the factors, e.g. specific gravity of wood, saw kerf, and log trim, with a comparison of profits from the sale of chips, based on weight, and of low-grade boards, based on bd. ft., and presents (*a*) the general equation, and (*b*) a set of tables and graphs, of equivalent net profits from sawing 1-in., 2-in., and 3-in. boards, assuming a net profit of $1·00/ton for chips.

8. FOREST PRODUCTS AND THEIR UTILIZATION

See also Nos. 2397–8, 3242.

3262. Justsuk, E. Den tekniska utvecklingen inom träförädlingsindustrien 1955. **[Technical developments in the wood-conversion industry in 1955.]** *Svensk Trävaru-Tidn.* Annual issue, 1956 (109–17). [Sw.]

Summarizes research at the Svenska Träforskningsinstitut, including seasoning, sawing, and strength properties; discusses developments in equipment for handling timber at the mill, sorting, barking, sawing and chipping; and lists new firms and extensions to plants etc.

3263. Karamchandani, K. P. **Progress of forest utilization in Bombay State during the past fifty years.** *Indian For.* 82 (12), 1956 (632–6).

81. Wood and Bark: Structure and Properties

810. General Information on Woods

See also Nos. 2565, 2569–70.

3264. **Specimen woods Nos. 253–255.** *Suppls.* to *Wood* 22 (1–3), 1957. Each pp. 2.

Southern Silky Oak (*Orites excelsa*), New South Wales Walnut (*Endiandra virens*), and Magnolia (*M. acuminata*, *M. grandiflora* and *M. virginiana*).

3265. **Notes on the utilization and silviculture of the timbers used in wood-based industries of India.** *Proc. 8th silv. Conf., Dehra Dun 1951*, Part 2, 1956 (118–49).

Lists, with their distribution and short notes on silvicultural characters, the species suitable for the plywood, match, paper, pencil, packing case, aircraft, sports goods, bobbin, rifle stock, and battery-separator industries.

3266. Bois tropicaux. **[Tropical timbers.]** Centre Technique Forestier Tropical, Nogent-sur-Marne. 1957. pp. 86 + map. [F.] Price *Fr.*200.

Short notes on nomenclature, properties, seasoning, uses, and trade for 60 tropical (mainly African) species.

3267. La page des bois tropicaux. **[Tropical woods.]** *Rev. Bois Appl.* 10 (12), 1955 (38); 11 (2; 5; 9/10; 11; 12), 1956 (39; 5; 28; 34; 38). [F.]

Terminalia superba, *Entandrophragma angolense*, *E. candollei*, *Lovoa klaineana*, *Bombax chevalieri*, and *Nauclea trillesii*.

3268. D. Drei Gabun-Hölzer. **[Three timbers from Gabon.]** *Holz- Zbl.* 83 (13), 1957 (144). 7 refs.

A description of Olon (*Fagara heitzii*), Ozigo (*Pachylobus buettneri*), and Zebrano (*Microberlinia brazzavillensis*), including nomenclature, provenances, habit, timber properties and uses.

3269. McCoy-Hill, M. **Timbers of Tanganyika.** *Timb. Technol.* 62 (2185), 1954 (559); 63 (2187–91; 2194, 2196, 2198), 1955 (20; 74; 142; 204; 260; 430–1; 538–9; 646–7); 64 (2201–2), 1956 (139–40; 200).

Descriptions of the tree and timber properties of *Brachylaena hutchinsii*, *Pterocarpus angolensis*, *Croton macrostachys*, *Pteleopsis myrtifolia*, *Podocarpus milanjianus*, *Chlorophora excelsa*, *Grevillea robusta*, *Rapanea rhododendroides*, *Entandrophragma* spp., *Afzelia quanzensis*, *Fagaropsis angolensis*, *Sterculia appendiculata*, *Piptadenia buchananii*, *Dalbergia melanoxylon*, *Cassipourea elliottii*, *Ocotea usambarensis*, *Khaya nyasica*, *Afrormosia angolensis*, *Parinari* spp., *Juniperus procera*, *Olea welwitschii*, *Trichilia emetica*, *Warburgia stuhlmannii*, *Trachylobium verrucosum*, *Erythrophleum guineense*, *Olea chrysophylla*, *Ficalhoa laurifolia* and *Olea hochstetteri*.

3270. **The timbers of New Zealand.** *Timb. Technol.* 63 (2190), 1955 (197–200).

Gives names, height and diam., distribution, description of timber, durability in and above ground, supply and uses of the timber of 27 species.

3271. Mateus, T. A aplicação racional da madeira de pinho na construção civil. **[The rational use of Maritime Pine in civil engineering.]** *Publicação, Laboratório Nacional de Engenharia Civil, Lisboa* No. 78, 1956. pp. 63. 67 refs. [Port.] P.R.

Information on the physical and mechanical properties of *Pinus pinaster*, its principal defects and its rational application, i.e. selection, uses and ways of dealing with defects.

3272. Pechmann, H. v. Holzuntersuchungen an Roteiche und Traubeneiche aus den Versuchsflächen der Badischen Forstlichen Versuchsanstalt in Baden-Baden. **[Analysis of *Quercus borealis* and *Q. sessiliflora* woods from trial plots of the Baden Forest Research Institute near Baden-Baden.]** *Allg. Forst- u. Jagdtzg.* '128 (1), 1957 (13–9). 7 refs. [G.g.e.]

A comparison of 2 stems of substantially the same size, aged 70 and 160 years, from neighbouring sites of good quality in the Schwarzwald foothills, for anatomical features, strength properties etc. *Q. borealis* wood was stronger and harder, though less durable. Its m.c. was greatest in the inner heartwood, while in *Q. sessiliflora* it was greatest in the sapwood.

3273. Angélique. **[*Dicorynia paraensis*.]** *Bois For. Trop.* No. 51, 1957 (17–20). [F.]

3274. Brazier, J. D. **Bubinga and allied timbers.** *Timb. Technol.* 63 (2191), 1955 (237–9). 6 refs.

Describes the anatomical structure of the woods of several *Guibourtia* species and their properties and uses.

3275. Kryn, J. M. **Courbaril. *Hymenaea* spp.** *Rep. U.S. For. Prod. Lab., Madison* No. 1942 (rev.) 1956. pp. 5 + 2 tbls. 6 refs. P.R. [Cf. *F.A.* 15 No. 2805.]

3276. Narayanamurti, D. **Composite wood timbers: *Pterocarpus dalbergioides*—Padauk.** *Comp. Wood* 3 (4), 1956 (71–5, 78). 12 refs. P.R.

3277. **Messmate Stringybark.** *Tech. Notes For. Comm. (Div. Wood Technol.) N.S.W.* 10 (1/2), 1956 (3–5).

Includes standard and other names, distribution, botanical and timber description, mechanical properties, seasoning schedule, durability and utilization of *Eucalyptus obliqua*.

3278. **Properties of Australian timbers. White Stringybark [*Eucalyptus scabra* and *E. globoidea*].** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 226, 1957 (3).

3279. **Osan (*Aningueria altissima*).** *Timb. Leafl. For. Dep. Uganda* No. 28, 1956. pp. 2. 1 ref.

Synonymy, botanical description, amounts available, mechanical and physical properties of wood, working qualities, seasoning, recommended circular- and band-saw specifications and uses.

811. Structure, Identification

3280. Jane, F. W. **The structure of timbers of the world. 27–33.** *Timb. Technol.* 62 (2186), 1954 (603–5); 63 (2190; 2192; 2193), 1955 (186–8; 303–5; 359–61); 64 (2200; 2201; 2203), 1956 (71–3; 127–9; 255–7).

(27) *Chlorophora excelsa*, *C. tinctoria*, *Castanospermum australe*. (28) *Pyrus malus*, *P. communis*, *Prunus avium*. (29) *Hymenaea courbaril*, *Mora excelsa*, *Ormosia dasycarpa*. (30) *Symphonia globulifera*, *Talauma plumieri*, *Dacryodes hexandra*. (31) *Celtis occidentalis*, *C. soyauxii*, *C. durandii*. (32) *Fraxinus nigra*, *Sassafras albidum*. (33) *Araucaria angustifolia*, *Agathis australis*.

3281. Šavrov, L. A. Anatomija drevesiny vidov roda èfedra Sovetskogo Sojuza. **[The wood anatomy of the *Ephedra* species of the U.S.S.R.]** *Bot. Ž.* 41 (9), 1956 (1324–31). 3 refs. [Russ.]

The main anatomical features are tabulated for the 9 species studied. General structural features, and similarities and differences between the species, are discussed, and suggestions are made on the origin of the wide rays and the peculiar 'stepped' outline of the annual rings.

3282. **The systematic position of the Elaeocarpaceae.** *Rep. imp. For. Inst., Oxf. 1955/56*, 1956 (18–9).

The wood structure indicates that the genera *Dicraspodia* and *Muntingia* of the Elaeocarpaceae should be placed in the Tiliaceae. From the evidence of both the botanical characters and the wood

it is tentatively concluded that, apart from *Micradesma* and *Muntingia*, the Elaeocarpaceae should be placed in the Parietales, but as a family separate from the Flacourtiaceae.

3283. JAMES, C. F., and INGLE, H. D. **The anatomy of the timbers of the south-west Pacific area —V. Flacourtiaceae.** *Repr.* from *Aust. J. Bot.* 4 (3), 1956 (200–15 + 3 plates). 9 refs.

An examination of 13 genera indicated 2 structural groups within the timbers of the Flacourtiaceae. The wood anatomy of genera examined from areas other than the S.W. Pacific was found to agree with these 2 groups. The anatomical features of each genus are summarized and the salient ones tabulated; from these a key has been prepared separating the genera where possible. The grouping of the genera described, based on wood anatomy, is compared with the grouping of the family based on botanical features. Anatomical features separating the Flacourtiaceae from the groups of timbers with some similar characteristics are indicated. [Cf. *F.A.* 18 No. 859.] *From authors' summary.*

811.1. Anatomical Elements and Tissues

See also Nos. 2508, 3451, 3485, 3489.

3284. IABLOKOFF, A. K. Structure cellulaire et propriétés mécaniques. L'exemple de l'épicéa. [**Cell structure and mechanical properties, taking Spruce wood as an example.**] *Rev. Bois Appl.* 10 (4–6; 7/8; 9/10; 11; 12), 1955 (23–4; 21–4; 6–9; 18–20; 14–8; 21–5; 26–8); 11 (3; 4; 6), 1956 (16–8; 14–8; 15–9). [F.]

Describes the structure and chemistry of Sprucewood cells, including much elementary information. Swelling phenomena are discussed, and a detailed exposition is given of the variability of cell structure and its causes, including environmental ones; also of the effect of morphological factors on the physical and mechanical properties of wood, this effect being illustrated from the author's experiments.

3285. NEČESANÝ, V. **The nature of the so-called tertiary lamella.** *Svensk PappTidn.* 60 (1), 1957 (10–6). 20 refs. [E.e.sw.g.] P.R.

Reviews literature on the morphological and chemical character of the inner layer of the fibre cell-wall, including Czech papers on the submicroscopic structure of cell walls, especially in reaction wood [see *F.A.* 17 No. 3203], and on the effect of wood-destroying fungi on the structure of the inner layer [cf. *F.A.* 18 No. 1061]. Concludes that the inner layer is an indivisible part of the secondary wall and cannot be regarded as a morphological individual. It consists of cellulose and is strongly lignified in normal wood and insignificantly so in reaction wood of hardwoods. It is generally absent from reaction wood of softwoods.

3286. MEIER, H., and YLLNER, S. **The tertiary walls of tracheids in Spruce pulp.** British Paper & Board Industry Research Association, Kenley, Surrey. [1957]. pp. 6. Transl. by H. W. Emerton from *Svensk PappTidn.* 59 (11), 1956 (395–401). [See *F.A.* 18 No. 861.] Limited distribution.

3287. FREI, E., PRESTON, R. D., and RIPLEY, G. W. **The fine structure of the walls of conifer tracheids. VI. Electron microscope investigations of sections.** *J. exp. Bot.* 8 (22), 1957 (139–46 + 6 plates). 30 refs. O.B.D.

The general plan of structure in conifer tracheids is confirmed by evidence of the electron-microscope [cf. *F.A.* 12 No. 2986]. The question of finer lamellation still remains incompletely answered. The investigation confirms the complexity in the walls of ray parenchyma mentioned by Ribi [cf. *F.A.* 16 No. 858].

3288. CARLSSON, C. A., and HARTLER, N. **On the microscopic examination of cellulose fibres under polarized vertical illumination.** *Svensk PappTidn.* 60 (3), 1957 (92–5). 1 ref. [E.e.sw.g.] P.R.

A study of Spruce sulphite fibres showed that the characteristic dark and light areas, explained by Emerson and Watts [see *F.A.* 16 No. 859] as representing the secondary and primary walls, are caused by contact, or its absence, between the fibre and the glass slide. The argument is illustrated by photomicrographs.

3289. ISENBERG, I. H. **The fine structure of the cambial wall of Bigtooth Aspen.** *Tappi* 39 (12), 1956 (882–3). 5 refs. P.R.

Under the electron microscope, the cambial wall of *Populus grandidentata* showed a random disperse orientation of microfibrils.

3290. STEMSRUD, F. **On the fine structure of the pit-closing membranes of conifers.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 3318, 1956. pp. 8 + 14 photos., 1 dgm. 18 refs. Transl. by W. Knie and H. E. Dadswell from *Holzforschung, Berlin* 10 (3), 1956 (69–75). [See *F.A.* 18 No. 864.]

3291. JURÁŠEK, L. Vznik thyl v bukovém dřevě. [**The origin of tyloses in Beech wood.**] *Drev. Výskum* 1 (1/2), 1956 (7–15 + 10 photos). 15 refs. [Cz.cz. russ.e.] P.R.

A study of the origin of tyloses in branchwood of *Fagus sylvatica* and their cell-wall composition. Tyloses were produced artificially at 25° C. and 98% relative humidity. They were found to develop just as well from the xylem as from the ray parenchyma if adjacent to a vessel. It was found that tyloses could be produced only by cells having large pit-pairs (diam. 10–15 μ), such cells being usually found at the ray margins. The bulging of the pit membrane into the vessel cavity occurred a few hours after the branch had been cut off. Clearly developed tyloses may be obtained within 24 hours; their growth ends when the vessel is plugged and the adjacent tyloses touch each other. Their walls never show secondary thickening or starch deposition; they consist of cellulose, probably impregnated with pectin, and do not lignify even when old; in dead tyloses brown pigments are deposited on them. A hypothesis is advanced that the formation of tyloses is due to hydrostatic pressure differences generated by capillary forces and by the difference of osmotic pressure between ray cell and vessel.

811.2. Special Features and Abnormal Structure

See also Nos. 2888, 3285.

3292. **Reaction wood (tension wood and compression wood).** *Leafl. For. Prod. Res., Lond.* No. 51, 1956. pp. 16.

Causes, recognition, practical importance and utilization.

3293. NEČESANÝ, V. Struktura reakčního dřeva. **[Structure of reaction wood.]** *Preslia* 28 (1), 1956 (61–5 + 8 photos). 11 refs. [Cz.russ.e.]

A review of work done by various authors. Their research and the author's indicate that the formation of both tension and compression wood is due to the different action of the cambium in the dorsal and ventral parts of the inclined axis, due probably to different concentrations of growth stimulants. The changes in cell formation, however, are always of the same order as between dorsal and ventral.

3294. GIOVANNI, M. U. DI. Dati dimensionali sulle fibre di tensione del legno di pioppo. **[Data on the dimensions of tension-wood fibres of Poplar.]** *Nuovo G. bot. ital.* (*n.s.*) 60 (1/2), 1953 (239–50). 5 refs. [It.e.] A.P.B.

Examination of the fibres from an area of tension wood in a sample from the stem of a young hybrid Poplar established the following points: The tension-wood fibres were shorter than those from normal wood and uniform in length within one growth ring, whereas normal fibres vary regularly, being shorter in the early than in the late wood. Fibres are more numerous in tension than in normal wood and overlap only for a short and almost uniform distance, whereas normal fibres overlap for long, irregular distances. It is concluded that tension wood represents an incompletely developed tissue.

811.4. Growth Rings. Early and Late Wood

3295. **[Abnormal rings in *Pinus radiata* wood.]** *Rep. For. Res. Inst. N.Z. For. Serv. 1955/56*, 1956 (19–20).

During the investigation of core rot of 38-year *P. radiata* in Naseby Forest [cf. *F.A.* 18 No. 3006] many rings of abnormal tissue were found within each annual ring of all trees examined. In some years the abnormal wood replaced the late wood altogether. It is suggested that the sustained low temperatures that occur in this forest may cause internal freezing in boles and roots at times when other conditions favour transpiration, thus producing a condition of physiological drought. The abnormal tissue is morphologically similar to that of European 'frost rings'.

3296. VERGNANO, O. L'evoluzione della cerchia legnosa in *Arbutus unedo* L. dal Marzo al Dicembre 1952 a Messina. **[The development of the annual ring in *A. unedo* from March to December 1952 at Messina.]** *Nuovo G. bot. ital.* (*n.s.*) 60 (1/2), 1953 (102–8 + 6 photos). 2 refs. [It.e.] A.P.B.

3297. RANIERI, A. M. Accrescimento in spessore del fusto di *Schinus molle* L. a Bari. **[Radial growth of *S. molle* at Bari.]** *Nuovo G. bot. ital.* (*n.s.*) 60 (3), 1953 (1954), (579–91 + 18 photos). 13 refs. [It.e.] A.P.B.

In order to observe the behaviour of tropical species when grown in Mediterranean conditions, a study was made of the cambial activity of two trees (one of each sex) of *S. molle* in the Botanical Garden at Bari. Activity was found to be sub-continuous throughout the year, with no true dormant periods but only periods of suspended activity, which did not occur simultaneously in the ♂ and ♀ plants. There are, therefore, no annual rings, but 3–4 successive 'growth rings' are laid down each year. This lack of a well defined growth cycle corresponds to a similar lack of a well defined seasonal cycle in the original habitat of *S. molle*, viz. high Peruvian valleys. Certain Mediterranean evergreen species (*Ficus carica*, *Olea europaea*, and *Phillyrea latifolia*) show a similar form of growth, and it is suggested that they belong to genera that originally developed in a tropical climate.

3298. MARANO, I. Accrescimento del legno in *Phillyrea latifolia* L. **[Growth of wood in *P. latifolia.*]** *Nuovo G. bot. ital.* (*n.s.*) 60 (1/2), 1953 (197–224 + 2 photos). 9 refs. [It.e.] A.P.B.

A study of wood formation in branches of this evergreen maquis species showed that it does not form a regular annual ring but a series of growth rings corresponding to periods of cambial activity. No typical early and late wood are recognizable. This behaviour resembles that of *Olea europaea* and differs from other Mediterranean evergreens.

811.5. Sapwood and Heartwood

3299. BENIĆ, R. Istraživanja o učešću i nekim fizičkim svojstvima bijeli i srži poljskog jasena (*Fr*[*axinus*] *angustifolia* Vahl). **[Investigations on the proportion, and some physical properties, of the sapwood and heartwood of *F. angustifolia.*]** *Glasn. šumske Pokuse* No. 12, 1956 (13–104 + 12 photos, 5 tbls.). 65 refs. [Croat.croat.e.*e.*]

Results of measurements and tests on stemwood of *F. angustifolia* from the forest area along the river Sava and of *F. excelsior* from the Zagrebačka Gora mountain near Zagreb and Mt. Risnjak in Gorski Kotar, from 5 dominant and 5 suppressed trees at each place, are presented in tables, graphs and diagrams, of moisture content (m.c.), number of growth rings, radius and area, and stem volume of both sapwood (s.w.) and heartwood (h.w.); density (oven-dry and basic), and shrinkage. The results, analysed statistically, show that the absolute number of growth rings in the s.w. of both species decreases from butt to top; this number depends on the age of the tree and usually increases with age; it also depends on crown size, mean growth-ring width and stem diameter; on the whole it is extremely variable even for a given set of conditions (exemplified in graphs and tables). In the h.w. of both species the number of growth rings usually increases from the butt up to a height between 2·4 and 4·6 m. and then decreases. The width of the s.w. zone decreases rapidly from the butt to a height of ca. 2·4 m., after which it decreases more gradually; the h.w. diam. increases from the butt up to a height between 2·2

and 6·8 m., and thereafter decreases. The maximum s.w. area is at a height of 20 cm.; higher up it consistently decreases. The maximum % of h.w. is found at heights between 1·3 and 9 m. in *F. angustifolia* and at 2·4 m. in *F. excelsior*. Both values increase with the age of the tree. A relationship $y = ax^b$ between the s.w. area y (in sq. cm.) and the crown volume x (in cu.m.) is suggested, a and b being coefficients depending on site class, crown class and height of section. For *F. angustifolia* (dominant trees, site class I, section height 2·4 m.) $a = 14{\cdot}399$, $b = 0{\cdot}672855$ and the coefficient of correlation is very high ($0{\cdot}904 \pm 0{\cdot}0287$), i.e. trees of this species with strongly developed crowns have little or no heartwood. The age at which s.w. changes into h.w. depends on the crown-volume/stem-diam. ratio. Trees with poor crowns start producing h.w. when 20 years old, whereas those with fully developed crowns remain without h.w. up to the age of 80 and more. The change of s.w. into h.w. usually starts at breast height, proceeding both downwards and upwards. The moisture content of h.w. in both species is greater than that of the s.w. The m.c. of h.w. in *F. angustifolia* decreases with increasing age. No significant differences have been found between the species as far as the following properties are concerned: density (oven-dry and basic), shrinkage and fibre-saturation point. [Tables 7, 8, 10 and 11, probably inset, are missing from the copy held.]

811.6. Texture, Grain, Figure

See also Nos. 2490, 3403, 3476.

3300. KADAMBI, K. **On the nature of twisted fibre and the occurrence of interlocked fibre in some trees.** *Proc. 8th silv. Conf., Dehra Dun 1951*, Part 2, 1956 (227–8).

Spiral grain, interlocked grain, or both, have been found in the following species: *Bombax malabaricum, Dysoxylum malabaricum, Dipterocarpus indicus, Mesua ferrea, Poeciloneuron indicum, Palaquium ellipticum, Terminalia tomentosa, Tectona grandis, Hopea parviflora, H. wightiana, Shorea talura, Salix tetrasperma, Calophyllum elatum, Casuarina equisetifolia, Xylia xylocarpa*, and *Tamarindus indica*. Interlocking grain improves bending and shear strength.

3301. GRUSCHOW, G. F. **Curly Pine.** *Sth. Lumberm.* 193 (2417—Christmas No.), 1956 (189–90).

Discusses the occasional occurrence of curly grain in Pine, usually in the lower part of mature trees, and describes and illustrates a Shortleaf Pine from Virginia whose bole had a bumpy appearance and contained a high % of curly-grained boards in the outer parts of its lower logs. No evidence of mechanical injury was found.

811.7. Phloem; Bark

See Nos. 2507–8.

812. Physical and Mechanical Properties

See also Nos. 2507–8, 3284, 3299, 3314.

3302. VOLKERT, E. Holzeigenschaften von Gastbaumarten. **[Wood properties of exotic species.]** *Holz Roh- u. Werkstoff* 14 (3), 1956 (81–6). 23 refs. [G.g.] P.R.

Sets out diagrammatically the densities, durability and some strength and working properties of *Pinus nigra, P. contorta, P. monticola, P. ponderosa, Abies cephalonica, A. amabilis, A. concolor, A. grandis, A. procera, A. nordmanniana, Picea sitchensis, P. omorika, Pseudotsuga taxifolia, Pinus strobus, Thuja plicata, Tsuga heterophylla, Larix leptolepis, Robinia pseudoacacia* and *Quercus borealis* timber, grown in Germany. Stresses the silvicultural rôle of exotic conifers in protecting Spruce stands against bark-beetles, windthrow, snow breakage, and deterioration of soil and water economy, and in increasing the volume yield.

3303. SAWADA, M., *et al.* **[Strength and related properties of Black Locust (*Robinia pseudoacacia* L.) grown in Akita prefecture, Japan.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 90, 1956 (145–244 + 23 photos). 10 refs. [Jap.jap.e.*e.*]

Contains comprehensive tables, photomicrographs, and details of test conditions, with American data for comparison.

812.1. Optical, Acoustic, Frictional, Thermal and Electrical Properties

See also No. 3415.

3304. THOMAS, P. H. **The contributions of wall linings to the growth of fire [with discussion].** *Rec. [6th] Conv. Brit. Wood Pres. Ass.* [1956] (112–44). 10 refs.

Includes details of a new flash-over test and preliminary results for some treated and untreated wood species.

3305. HUMPHREYS, F. R. **Wood fuel.** *Tech. Notes For. Comm. (Div. Wood Technol.) N.S.W.* 10 (1/2), 1956 (6–9).

Covers general considerations on calorific value, combustion, suitable domestic stoves and industrial furnaces, and briquetting, and gives a table of calorific values of 18 species including 10 Eucalypts and *Pinus radiata*, air-dry (12·5% m.c.) and green (various m.c.'s).

3306. ŠTOFKO, J., and ADAMČA, M. Príspevok k poznaniu dielektrických vlastností našich drevín a glejov. **[Dielectric properties of Czechoslovakian timbers and glues.]** *Drev. Výskum* 1 (1/2), 1956 (69–82). 7 refs. [Slovak.slovak.russ.g.] P.R.

Results of measurements of the dielectric constant ϵ and loss (tan δ) of Beech, Elm and Poplar wood at two moisture contents (8 and 12·6%) in the frequency range between 5×10^4 and 2×10^7 cycles/sec. showed that: (1) the values decrease as frequency rises; (2) other conditions being equal, ϵ varies directly as the density (for the same species); (3) differences between the ϵ values for different species increase at higher m.c.; (4) minimum values of tan δ (which is not influenced by wood density) were found between 3×10^5 and 2×10^6 cycles/sec. Measurement results are given for ϵ, tan δ and specific conductivity (in the same frequency range as before) of the [Czechoslovakian] phenol-resorcinol glue FR-80, as functions of the time of curing, using 40% formaldehyde as catalyst. As condensation progresses, all 3 values decrease, the decrease being

rapid until the glue reaches the 'rubbery' state (roughly after 4 hours) and then very gradual between 4 and 24 hours.

812.2. Behaviour with Liquids and Gases. Moisture Relations etc.

See also Nos. 2900, 3312, 3345-6, 3433, 3436, 3466.

3307. UEMURA, T. **[Measurement of moisture content in wood by some Japanese moisture-meters of electrical resistance type.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 90, 1956 (245–55). 6 refs. [Jap.jap.e.*e.*]

Readings with 3 meters checked against weighed moisture showed that: (1) the difference in readings between rough and smooth surfaced timber is negligible; (2) the deeper the probes were driven, the higher was the reading; (3) readings of radial sections were higher than those tangential, and tangential higher than those of transverse sections; with the current || to the grain, readings were higher than when it was ⊥; (5) where there is a moisture gradient, the readings represent only the part probed. Graphs indicate the corrections required for each instrument.

3308. UEMURA, T., and TOEDA, T. **[Test of the Siemens moisture meter.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 90, 1956 (257–72). 4 refs. [Jap.g.*g.*]

Gives data from tests similar to those reported in the preceding abstract, with 4 types of electrode and various species of timber, to show the variation of readings, precautions for use, and corrections required.

3309. KNIGHT, R. A. G., and NEWALL, R. J. **The superficial movement of plywood.** *Timb. Technol.* 64 (2203), 1956 (247–51).

A report collating measurements made between 1941 and 1953, the procedure over this period being sufficiently standardized for the results to be comparable. The plywood test-pieces were made from woods of 69 species; they were 3-ply, the veneers being 0·02, 0·062, or 0·064 in. thick, and bonded with phenolic film or liquid glue. The tests included transferring the test-pieces from low to high air humidity (*A*), and from low humidity into water (*B*). Movement was the same for all plywoods 0·06 and 0·19 in. thick; it was not clearly related to wood density; across the grain of the face veneer it was 1·5 times as much as along it. Mean values of the average of movement across and along the grain for the 69 species were 0·2% for test *A*, and 0·25% for *B*. The maximum and minimum movements recorded for each were 0·1–0·45 and 0·15–0·55%. The movement of plywood across the grain was 4% of that of veneer or solid wood. *From authors' summary.*

812.3. Density. Specific Gravity. Buoyancy

See also Nos. 3208, 3344.

3310. **Silvicultural relations.** *Rep. For. Res. Inst. N.Z. For. Serv. 1955/56,* 1956 (22–3).

The effects of environment and silvicultural treatment on wood density are being studied on thinnings from permanent sample plots. The immediate effect of thinning has been favourable in that none of the species examined has so far shown any reduction in density in wood formed subsequent to thinning, and *P. elliottii* actually showed an increase of 6 lb./cu. ft. air-dry density.

3311. FRY, G. **Density of the wood of *Pinus patula* grown in Kenya.** *Rep. imp. For. Inst., Oxf. 1955/56,* 1956 (18).

A study was made of variation of density in relation to (*a*) age from pith and (*b*) ring width. It was found that both factors are significant, but that (*a*) decreases markedly after ca. 10 years. Early wood was very thick-walled, comparable to early late-wood in temperate woods, so that the difference in density between early and late wood was very small and the proportion of late wood has little effect on density.

3312. LENZ, O. Le bois des principaux peupliers et d'un saule indigènes en Suisse. **[The wood of the chief Poplars and a Willow native to Switzerland.]** *Mitt. schweiz. Anst. forstl. Versuchsw.* 32 (5), 1956 (203–27 + 7 photos). 12 refs. [F.f.g.it.e.]

A study based on numerous samples from 6 *Populus nigra*, 15 *P. tremula*, 3 *P. alba* and 5 *Salix alba* trees of varying ages and sizes from 7 places in Switzerland, chiefly concerned with oven-dry density and volume shrinkage. Mean o.d. densities in g./c.c., in the order given above, were 0·45, 0·47, 0·37 and 0·39, and corresponding shrinkage values in % of green volume 14·2, 13·6, 11·4 and 11·1. Micrometric data on heartwood and sapwood are presented to elucidate the lower density of the former in White Poplar and its greater density, as compared with the sapwood, in the Willow. A table compares maximum, minimum and mean o.d. densities and shrinkage values of these species with similar data from some Swiss cultivated Poplars [cf. *F.A.* 16 No. 883] and 3 tropical woods.

812.7. Strength Properties

See also Nos. 3363–4, 3367–8, 3373–6.

3313. HELLAWELL, C. R.; WARREN, W. G. **[The sampling of timber for standard mechanical tests. Part I: a practical comparison of two sampling methods. Part II: estimating the species means and variability.** *N.Z. For. Res. Note N.Z. For. Serv.* No. 7, 1956. pp. 12. 7 refs.

The selection of test material in New Zealand is usually made in accordance with the Australian method, by which multiple specimens are taken from each of 5 trees. A comparison was made between this method and random sampling of one specimen each from a larger number of trees. An experiment with 1 specimen from each of 20 trees of Rewarewa (*Knightia excelsa*) showed that, for static bending, results were twice as accurate (in terms of probable S.E.) as those obtained from 49 specimens from 5 trees. The effect of the number of specimens per tree and number of trees sampled on estimates of species mean was also studied, and here too random sampling of one specimen per tree was found to be

more efficient than a larger number of specimens from fewer trees. A formula for relative efficiency is developed.

3314. **Methods of testing small clear specimens of timber.** *Brit. Stand.* No. 373, 1957. pp. 31. Price 6*s*. P.R.

813. Wood Chemistry

3315. FOGELBERG, B. C. Fysikaliska hjälpmedel inom träforskningen. [**Physical methods in wood [chemistry] research.**] *Pap. ja Puu* 38 (9), 1956 (471–4). 26 refs. [Sw.e.fi.] P.R.

A review of literature on the use of isotopes, infra-red spectroscopy, and more briefly, some other methods.

3316. SHARKOV [ŠARKOV], V. I., and MUROMTSEVA [MUROMCEVA], V. S. **Chemical composition of *Eucalyptus* wood.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 3097, 1956. pp. 3. 1 ref. Transl. by E. Feigl from *Ž. prikl. Him.* 27 (6), 1954 (687–8). [See. *F.A.* 16 No. 917.] P.R.

813.1. Chief Organic Constituents. Constituents of the Cell Wall

See also Nos. 2468, 3153.

3317. ENKVIST, T. Ligninforskningen i detta nu. [**Present-day lignin research.**] *Pap. ja Puu* 38 (9), 1956 (376–82, 390). 63 refs. [Sw.e.fi.] P.R.

A review of European and American literature on the constitution of lignin and its potential uses.

3318. MAZEN-PAPLER, M. T. **Contribution to the study of the lignification of plant cell walls.** Forest Products Research Laboratory, Princes Risborough. [1956] pp. 27. 79 refs. Transl. by E. W. J. Phillips and W. P. K. Findlay from *Thesis, University of Grenoble* 1953. Limited distribution.

Contains sections on: summary of present knowledge, appearance, location and behaviour of lignin *in situ*, fungal breakdown, action of chemical reagents on structure and coloration of sections of lignified tissues, and conclusions.

3319. BLAND, D. E., and HIRNYJ, B. **Variation in the lignin laid down by *Eucalyptus regnans* at different stages of growth.** *Nature, Lond.* 179 (4558), 1957 (529–30). 5 refs.

An investigation was made of the variation in the lignin spectrum with radial position in the tree. Eleven specimens were taken from pith to sapwood from a butt log of *E. regnans*, 46 in. in diam. and showing 90 growth rings. The spectra were found to vary systematically from the heart outwards. It appears from this examination that the lignin laid down in the young tree is not transformed to the type found in the outer heartwood of mature trees. Thus the distinction between the two types of lignin is not connected with the sapwood-heartwood transformation. Further investigations of tension-wood lignin and of the spectra of methanol lignin fractions are being carried out, and a full account will be published later.

3320. FREUDENBERG, K. Beiträge zur Erforschung des Lignins. [**Contributions to the study of lignin.**] *Angew. Chem.* 68 (16), 1956 (508–12). 32 refs. [G.g.] D.S.I.R.

A survey of recent research, in which native and synthetic lignin preparations are compared. Wood enzymes produce from coniferyl alcohol the same products as fungus enzymes. The 5-carboxyl of isohemipinic acid comes from the middle C atom of coniferyl alcohol.

3321. KÜRSCHNER, K., and HOSTOMSKÝ, J. O dvojitých väzbách v prírodných lignínoch. [**Double bonds in native lignins.**] *Drev. Výskum* 1 (1/2), 1956 (35–50). 29 refs. [Slovak.russ.g.] P.R.

Improving on the bromination method described in a previous paper [see *F.A.* 1 p. 276 (Kürschner and Wittenberger)], the authors developed a greatly simplified method of lignin determination and of unequivocal detection of double bonds in woods that had not been previously subjected to any chemical or physical treatment. The method is based on the finding that, whereas in the presence of CCl_4 bromine completely saturates all double bonds in the wood, an addition of water during bromination *in vacuo* causes Br to combine with double bonds only in the aromatic lignin nucleus.

3322. KJURŠNER [KÜRSCHNER], K., and GOSTOMSKIĬ [HOSTOMSKÝ], J. O dvoĭnyh svjazjah v prirodnyh ligninah. [**Double bonds in native lignins.**] *Ž. prikl. Him.* 29 (10), 1956 (1529–40). 25 refs. [Russ.] P.O.

See preceding abstract.

3323. ČUDAKOV, M. I. O kondensacii lignina s fenolom. [**Condensation of lignin with phenol.**] *Ž. prikl. Him.* 29 (9), 1956 (1418–24). 12 refs. [Russ. russ.] P.O.

When studying the nature of the 'phenol-lignins' obtained at a high temperature from both the 'native' and hydrolysis lignin with an excess of phenol, it was found that the yield of diphenylene oxide produced by heat depends on the degree of polymerization of the original lignin. Since a similar behaviour is found in ethylene glycol and phenyl glycol, it seems that glycol groups exist in the side chain of the lignin complex. A mechanism for the phenol-lignin condensation is advanced.

3324. PEARL, I. A., and BEYER, D. L. **New developments in the chemistry of Aspen lignin.** *Tappi* 40 (1), 1957 (45–54). 7 refs. P.R.

The average OCH_3 content of *Populus tremuloides* lignin was found to be much less than the commonly accepted figure of 21%. Results of fractionation by means of isopropanol, ethyl ether, and ion-exclusion processes are presented.

3325. ŠARKOV, V. I., and DOBUŠ, O. A. Issledovanie mehanizma gidroliza polisaharidov metodom termičeskogo vozdeĭstvija. [**Investigation of the mechanism of the hydrolysis of polysaccharides by heat treatment.**] *Gidrol. lesohim. Prom.* 9 (8), 1956 (3–4). 7 refs. [Russ.] P.R.

Soft (viscose) Spruce sulphite pulp containing 2·9% pentosans and 6·0% mannan was heated in paraffin (kerosene) and in glycerol for 3 hours at 200° C.; in the former case the proportions of

pentosans and mannan were reduced to 2·1 and 2·7%, in the latter to 2·6 and 5·6%, respectively. The high protective effect of glycerol on hemicelluloses is due to hydrogen-bond formation and to the absence of such bonds between the macromolecules of cellulose and the 'occluded' hemicelluloses. Similar figures were obtained when an additionally hydrolysed pulp was used in the experiment.

3326. TIMELL, T. E. **Nitration as a means of isolating the alpha-cellulose component of wood.** *Tappi* 40 (1), 1957 (30–3). 27 refs. P.R.

It was found that the amount of α-cellulose in 4 broadleaved and 6 coniferous woods, determined by conventional methods (Tappi Standard T 9 m-51), is somewhat higher than the maximum cellulose yield obtained by direct nitration. After correction for the non-glucan material present, both methods gave approximately the same values for the cellulose content of the 10 woods. The reasons for this agreement are discussed.

3327. TIMELL, T. E. **Molecular properties of seven native wood celluloses.** *Tappi* 40 (1), 1957 (25–9). 17 refs. P.R.

Degrees of polymerization and chain-length distribution were determined for celluloses obtained by nitration from the wood of *Populus tremuloides*, *Acer rubrum*, *Tsuga canadensis*, *Pinus banksiana*, *Larix laricina*, *Fagus grandifolia* and *Thuja occidentalis*. [Cf. *F.A.* 17 No. 834.]

3328. GUSTAFSSON, C. Suomen puulajien hemiselluloosasta. **[Hemicellulose in Finnish wood species.]** *Pap. ja Puu* 38 (9), 1956 (383–40). 33 refs. [Fi.fi.e.] P.R.

Discusses the chemical constitution of the hemicelluloses and gives tabulated data on the relative amounts of the most common carbohydrates in 8 important Finnish species, total analyses for Pine, Spruce and Birch, and analyses of pulps.

3329. KJURŠNER [KÜRSCHNER], K. Bystryĭ sposob opredelenija pentozanov v drevesine. **[A rapid method of determining pentosans in wood.]** *Ž. prikl. Him.* 29 (8), 1956 (1209–23). 94 refs. [Russ.] P.O.

A survey of various papers on this subject is followed by a detailed description of a new method in which the furfural yield from xylose is claimed to be ≃ 97%. Optimum conditions are: 12–13% HCl and 160° C.

813.2. Minor Organic Constituents. Extractives. Cell Contents

See also Nos. 3036, 3452.

3330. BERGSTRÖM, H. **Wood chemistry research at Kolningslaboratoriet [since 1902]. Part I. Extracts and products from wood.** *Svensk PappTidn.* 59 (23), 1956 (829–35). 27 refs. [E.e.sw.g.] P.R.

Gives data on wood extractives and their composition and changes in wood during various processes, e.g. storage, seasoning, saccharification.

3331. MALEVSKAJA, S. S., and KARNAUHOVA, V. D. Smola v drevesine eli. I. **[Resin in the wood of *Picea abies*. I.]** *Ž. prikl. Him.* 29 (3), 1956 (401–10). 11 refs. [Russ.russ.] P.O.

Sawdust prepared from (1) freshly (winter and spring) felled Spruce logs and (2) logs that were stored in an open space from April till September, was extracted with petroleum ether (*a*), ethyl ether (*b*), dichloroethane (*c*) and acetone (*d*). It was found that each solvent extracts the constituents of resin selectively. Any increase in the proportion of acids in the extracts causes a considerable increase in the proportion of resin acids, whereas the corresponding variation in fatty acids is less significant. Storage results in an entry of O into the molecules of resin acids. Oxidized acids with up to 3 atoms of O are dissolved by (*b*) and (*d*). Oxidation mainly affects bonds other than double; one of the added O atoms forms an OH group. The maximum content of unsaturated acids is found in neutral fats, less in the soda extract and least of all in the alkaline extract; the unsaturated acids consist of oleic, linoleic and linolenic acids. Unsaponifiable constituents (alcohols, sterols) were determined chromatographically.

3332. KAŇÁK, K. O smolnatosti kmenů borovice lesní (*P. silvestris* L.) z různých stanovišních podmínek Čech. **[Resin content of *Pinus sylvestris* stems under different site conditions in Bohemia.]** *Sborn. čsl. Akad. zeměd. (Lesn.)* 29 (9), 1956 (645–56). 10 refs. [Cz.cz.russ.e.*russ.e.*]

Presents, with graphs and histograms, the results of extractions with ethyl ether of (*a*) wood samples, taken at 3 different heights from each of 13 stems (12 living and 1 dead) from 8 different localities, (*b*) sawdust samples from each metre of the stem, from the same trees. The total resin content varied considerably for different sites, the extreme ratio being ca. 1/3, and increased with increasing age and d.b.h. On marshy sites it was low. Within the stem, it was at maximum in the butt, decreased up to a height of 7–12 m., and above that increased again, reaching a second maximum at the base of the crown.

3333. AHLUWALIA, Y. K., DASS, I., and MEHTA, A. C. **Crystalline components of certain Indian Pines.** *Curr. Sci.* 25 (11), 1956 (367). 4 refs. A.P.B.

Heartwood of *Pinus longifolia* revealed the presence of pinobanksin (0·02%), pinocembrin (0·015%) and a stilbene derivative identified as pinosylvin monomethyl ether (0·02%). From heartwood of *P. gerardiana* were isolated pinobanksin (0·03%), pinostrobin (0·005%), pinosylvin monomethyl ether (0·05%) and 1-arabinose. Heartwood of *P. khasya* contained pinocembrin (0·12%), pinosylvin monomethyl ether (1·15%) and 1-arabinose.

3334. MACLEAN, H., and GARDNER, J. A. F. **Distribution of fungicidal extractives (thujaplicin and water-soluble phenols) in Western Red Cedar heartwood.** *For. Prod. J.* 6 (12), 1956 (510–6). 17 refs.

Describes the methods used in the chemical analysis of samples from 8 trees aged from 20 to 750 years. Hot-water solubilities varied from 1·2 to 23·3% and thujaplicin content from nil to 1·2%. Both values, and the % of water-soluble phenols within the water solubles, tended to increase radially from the pith and to decrease with height

up the stem. They were higher in light-coloured than in dark, heartwood (h.w.). Values in new h.w. of young trees were lower than in new h.w. of old trees, and corresponded more to those of the older h.w. of the latter. Possible causes of colour variations, including chemical changes, not necessarily induced by wood-destroying micro-organisms, are discussed [cf. *F.A.* 4 p. 35].

3335. PERILÄ, O., and MANNER, P. **On the location of the acid extractives of the Alder (*Alnus incana*), Pine (*Pinus silvestris*), Spruce (*Picea excelsa*) and Juniper (*Juniperus communis*).** *Pap. ja Puu* 38 (10), 1956 (499–503). 1 ref. [E.e.] P.R.

The extractives were converted to Bi salts to fix them and were then stained. Results are shown in photomicrographs. In Alder the extractives were found mainly in the ray cells, but also in the middle lamellae of other cells and on the walls of vessels. In Spruce and Pine they were concentrated mainly in the cells of both radial and vertical resin canals and in all 3 softwoods in the ray cells and the middle lamellae of tracheids.

3336. PERILÄ, O. **Saturated fatty acids of stem cells of Birch (*Betula verrucosa*) and Aspen (*Populus tremula*).** *Annales Academiae Scientiarum Fennicae, Helsinki* (*Ser. A II*) No. 76, 1956. pp. 49. 88 refs. [E.e.] L.S.

Reviews literature on saturated fatty acids in other woods and on methods of analysis, and gives photomicrographs of sections showing the location of extractives soluble in diethyl ether as such but insoluble in diethyl ether as bismuth salts, mainly in the medullary rays of both species. [Cf. *F.A.* 15 No. 4104.]

3337. PERILÄ, O. **Investigations on the ethereal extract of Aspen wood (*Populus tremula*).** *Suomen Kemistilehti, Helsinki* 28*B* (3), 1955 (109–10). 4 refs. [E.] L.S.

The following were tentatively identified: a sitosterol glucoside, cerotic (hexacosanoic) acid, and lignoseric (tetracosanoic) acid.

3338. CARRUTHERS, W. R., HAY, J. E., and HAYNES, L. J. **Isolation of bergenin from *Shorea leprosula*: the identity of vakerin and bergenin.** *Chem. & Ind.* 1957 (3), (76–7). 2 refs. P.R.

The bergenin isolated from the heartwood appears to be identical with vakerin [see *F.A.* 16 No. 77].

3339. SANDERMANN, W., and SCHWARZ, E. Über den Einfluss von Holzinhaltsstoffen auf Witterungsbeständigkeit und Trocknung von Öl- und Polyesterlacken. **[Effect of wood extractives on the weathering resistance and drying of oil varnishes and polyester lacquers.]** *Farbe und Lack, Hannover* 62 (4), 1956 (134–45). 24 refs. [G.g.] P.O.

Many woods, particularly those with phenolic extractives, considerably reduce the weathering and drying qualities of some varnishes; this was confirmed by tests with untreated and extracted woods. Coatings with pigments were more attacked than those without pigments; most affected were coatings on Iroko, Redwood [?] and Oak. The drying of polyester lacquers was very strongly inhibited by extractives of Iroko and Palisander. Quinone, vanillin and chlorophorin were also found to be strong inhibitors.

813.4. Chemical Effects of Heat. Chemistry of Thermal Decomposition

See also No. 3325.

3340. KOHARA, J., OKAMOTO, H., and SHIGEMATSU, Y. **[Studies on the permanence of wood. XVI. Analysis of heat-treated wood compared with old timbers. Part 1.]** *Scientific Reports of the Saikyo University* (*Agriculture*), *Kyoto* No. 7, 1955 (57–61). 4 refs. [Jap.e.]

Samples of sawdust of *Chamaecyparis obtusa* and *Zelkova serrata* were analysed at 4-day intervals during heating at 130° C. for 12 days. Differences in the rate of decomposition of cellulose between the two species are less marked in heat treatment than in old wood. The increase in the amount of soluble constituents accompanying the decomposition of cellulose in old wood is also less marked in heat-treated wood and is less in *Z. serrata* than in *C. obtusa*. The rate of cellulose decomposition as a result of heat treatment is 10^4 to 10^5 that found in old timbers. *From authors' summary.*

813.8. Poisonous and Irritant Properties

3341. SANDERMANN, W., and BARGHOORN, A.-W. [Editors]. Betriebsblatt 7. Gesundheitsschädigende Nutzhölzer. **[Factory chart 7. Woods injurious to health.]** *Holz Roh- u. Werkstoff* 14 (1), 1956 (37–40). [G.] P.R.

Lists, for 42 species, family, German name, botanical name, origin, use, nature of complaint, irritants. Twenty other 'doubtful' timbers are also listed.

3342. SANDERMANN, W., and BARGHOORN, A.-W. Gesundheitsschädigende Hölzer. **[Woods injurious to health.]** *Holz Roh- u. Werkstoff* 14 (3), 1956 (87–94). 61 refs. [G.g.] P.R.

Indicates the toxic or irritant agents present in ca. 40 woods known to be injurious to health, and gives precautions to be taken when working with them.

814. Natural Durability. Old Wood. Fossilized Wood

See also Nos. 2491, 3334, 3340, 3444–5, 3452.

3343. WALTERS, C. S., PETERSON, K. R., and FOX, H. W. **Diameter of White Pine posts no indicator of service life.** *For. Note Ill. agric. Exp. Sta.* No. 71, 1957. pp. 3.

Analysis of service life of 25 untreated *Pinus strobus* fence posts indicates that there is no significant correlation between top diameter and natural durability.

815. Effect of Growth Factors on Structure and Properties

See also Nos. 3208, 3236, 3300, 3310–1, 3319, 3332, 3476.

3344. KANO, T. **[Forest-biological studies on wood quality. (Report 11). On the growth of wood quality of the afforested [planted] trees at Nopporo district in Hokkaido.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 90, 1956 (37–76 + 8 photos). 7 refs. [Jap.jap.e.*e*.]

[Cf. *F.A.* 16 Nos 2212–4.] Covers in a 3½-page English summary the results of an examination of the external appearance and wood defects in standing trees (sweep, scars, frost-shake); ring width, late wood % and bulk density (as these vary with position in the stem, crown class, natural and plantation-grown trees, site and species); and weight and volume increment. For the species studied the m.a.i. to 40 years in cu.m. and kg./ha. was: *Pinus strobus* 12·7 cu.m., 3510 kg.; *Abies mayriana* 10·2, 3280; *Populus maximowiczii* 8·1, 2400; *Picea abies* 7·6, 2610; *Larix gmelini* 7·1, 2940; *L. leptolepis* 7·0, 2690; *Fraxinus mandshurica* 5·1, 2760; *Picea jezoensis* 4·4, 1540.

3345. KABURAGI, Z. **[Forest biological studies on wood quality (Report 12). On the water content of green stem of planted trees grown at Nopporo District in Hokkaido.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 90, 1956 (77–108 + 2 tbls., 1 set of dgms.). 14 refs. [Jap.jap.e.*e*.]

Volumetric shrinkage is investigated in the same timber samples (at 2-m. intervals up the tree and from the N., S., E. and W. sides) and the same 8 species as in Report 11 [see preceding abstract]. The distribution of this shrinkage through the stem (for dominant and suppressed trees), its relation to bulk density, differences in the stemwood of the crown, clear bole and butt, heartwood and sapwood are detailed. An attempt to establish the clear bole as the most suitable place for standard shrinkage sampling awaits clarification of the effect of annual-ring structure.

3346. KABURAGI, Z. **[Forest biological studies on wood quality. (Report 13). On the volumetric shrinkage of wood of the planted trees grown at Nopporo District in Hokkaido.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 90, 1956 (109–44 + 1 set of gphs.). 10 refs. [Jap.jap.e.*e*.]

Covers in a 2½-page English summary and a conspectus table the variation of water content in the green stem in the 8 species referred to in the previous abstract. Data are given by species for the distribution of water (diagrams); mean water contents of sapwood and heartwood; differences between dominant and dominated stems; variations according to position of sample, compass directions, crown length and taper; water and timber weight per ha. and per tree; and ratio by volume of wood substance, water and air.

82. Conversion, Shaping, Assembly and Finishing of Wood: General

3347. REINEKE, L. H. **Motion energy of wood particles.** *For. Prod. J.* 6 (12), 1956 (507–9).

Analyses the energy expended in moving sawdust, shavings and chips, and the implications of the factors involved for saw speed, size of motor, chipper construction etc. The motion (kinetic) energy of the chips being a function of the square of the cutting edge speed, the power required for sawdust motion becomes an important factor at very high saw speeds.

3348. **Machines and equipment.** *Wood* 22 (2), 1957 (66–7).

Describes with illustrations a variety of equipment, including a tenoning attachment and a belt sander (Interwood Ltd.), and a portable bush log-mill having twin circular saws mounted on 3 trailers, made for use in Tanganyika by Stenners of Tiverton, Ltd.

821. Barking

See also No. 2916.

3349. FOBES, E. W. **Developments in debarking.** *Rep. U.S. For. Prod. Lab., Madison* No. 2071, 1956. pp. 3 + 2 tbls., 2 gphs. P.R.

Presents tables and graphs for obtaining (1) cords of pulpwood (for different species) from linear feet, and (2) cords per hour from linear feet per minute, and vice versa. Another table compares the efficiency of different types of barkers (drum, cambium-shear, and chain-flail), when working on 8-in.-diam. wood.

3350. ST., G. Maschinelle Entrindung durch Reibung. **[Mechanical friction barking.]** *Umschau, Frankfurt am Main* 55 (11), 1955 (345). [G.] L.S.

The barker, of German manufacture, consists of a drum 3 × 5 m. (capacity ca. 19 cu.m.) with a profiled, slit surface, rotating in a water tank at 4·5 rev./min. The rubbed-off bark falls out through the slits. It is designed for floated wood whose bark and cambium have swelled through immersion in water. No wood is lost.

822. Saws and Sawing

See also section 832.1 and Nos. 2899, 3348, 3396.

3351. CHARDIN, A. L'étude du sciage par photographie ultra-rapide. **[The study of sawing by ultra-rapid photography.]** *Bois For. Trop.* No. 51, 1957 (40–51 + 1 plate). 4 refs. [F.e.span.]

The Centre Technique Forestier Tropical is making use of a flash generator, the 'Defatron', in order to study the flow of chips through the gullet of a saw tooth. It is possible to obtain ultra-short (one-millionth of a second) flashes which yet emit an energy of 200 joules. The photographs thus obtained, of which some 30 are reproduced, emphasize the effect of chip thickness, cutting angle, cutting speed, species, and depth of cut. Additional data can be obtained by using colour films to photograph the sawing of plywood made up of different coloured plies (4 photographs reproduced).

3352. MAGYAR, L. O noua metodă de debitare a traverselor şi a doagelor. **[A new method of converting a log into sleepers and staves.]** *Rev. Pădurilor* 71 (5), 1956 (310–4). [Rum.]

Describes, with numerous diagrams, the Zebrac sawmill, designed to convert Beech logs into sleepers and stavewood, the latter being obtained from edgings and slabs.

3353. WICHMANN. Vorrichtung zum Einschneiden kurzer Rollen auf dem Vollgatter. [**A set-up for sawing short lengths on a frame saw.**] *Holz-Zbl.* 83 (35), 1957 (971). [G.]

Describes a simple type of guiding channel made by bridging two log carriages with a pair of long scantlings along which the short logs travel in a continual series, not set individually except for adjusting the height of the upper feed-roller. This method is said to reduce log-kick considerably.

3354. ANTOINE, R. Influence de la vitesse de passage de l'outil sur le travail spécifique des dents dans les scies à bois. [**Effect of saw speed on the specific work of teeth in wood saws.**] *Rev. Bois Appl.* 11 (3), 1956 (5–10). [F.]

The depth of cut has an important effect on the specific work, probably because a greater depth of cut means a greater chip volume: when the chip fills the gullet completely, it produces a braking effect. The author discusses Reineke's ideas on the work done by each tooth [cf. *F.A.* 12 No. 1302; 16 No. 4553] and then refers to his own findings [cf. *F.A.* 16 No. 2219] according to which the specific-work/feed-rate curves, determined for commercial saws, have a minimum, i.e. the specific work falls to a minimum value for a certain feed rate of timber or, more accurately, for a certain (optimum) bite. The latter can be attained: (1) by adjusting the feed rate; this procedure, when applied to the descending part of the curve, can result in an excessive increase of power consumption (p.c.); (2) by decreasing the pitch, which involves technical difficulties, such as weakening the saw, increasing the labour of sharpening etc., and (3) by varying the saw speed. While the specific-work/feed-rate curve for a given saw speed has a distinct minimum, the specific-work/saw-speed curve for a given rate of feed is a rising parabola. A series of experiments with different saw speeds and rates of feed resulted in a set of specific-work/feed-rate curves, from which valuable information can be deduced. If, e.g. conditions prescribe a low rate of feed (r.f.), it is imperative to use a low saw-speed (s.s.), in order to avoid a very high specific work (s.w.). On the other hand, for high values of r.f. it is necessary to choose high s.s., and vice versa. Along the 'equal-bite' curves intersecting the s.w./r.f. curves the s.w./s.s. remains unchanged. For bite values lower than the optimum, the s.w. increases together with the s.s., and the gradient of this increase is the greater, the greater the deviation from the optimum bit value. For conventional sawing machines, the increase of r.f. at constant s.s. causes a decrease of s.w. and increase of p.c.; on the other hand a decrease of s.s. at constant r.f. causes a diminution of both s.w. and p.c. It is obvious that, unless r.f. is high, the s.s. should be low. A record of p.c., illustrated diagrammatically, shows that, at s.s. of 500 m./min., a 50-mm.-wide bandsaw had a smaller p.c. when cutting *Parinari* sp. than the same blade when running idly at s.s. of 2400 m./min.

3355. **Swedish investigation into 'counter' and 'climb' ripsawing.** *Timb. Technol.* 63 (2189), 1955 (146–7). 3 refs.

A summary of a Swedish publication [see *F.A.* 17 No. 864].

3356. AZZOLA, F. K. **Relationships between shape of teeth, rate of feed and the specific work of cutting in ripping with a circular saw.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 2578, [1955?]. pp. 3 + 5 gphs. 5 refs. Transl. by E. Feigl from *Holz-Zbl.* 80 (108), 1954 (1266). [See *F.A.* 17 No. 3282.] Limited distribution. P.R.

3357. BLOOR, T. **Swages for wide bandsaws.** *Woodwkg. Ind.* 12 (12), 1955 (737–8). P.R.

Describes the correct use of swaging tools.

3358. NIELSEN, F. B. Et hjelpemiddel til nøyaktigere postering av rammesagblad. [**A means for accurate setting of frame-saw blades.**] *Norsk Skogind.* 11 (2), 1957 (64–7). [Nor.e.] P.R.

Experiments at a sawmill showed that much more accurate settings were obtained with gauges of machined bakelite than with hand-made wooden gauges.

3359. KURODA, I., and YAMAGUCHI, K. [**Suitability and selection of abrasive wheels for saw-grinding performance.**] *Bull. For. Exp. Sta. Meguro, Tokyo* No. 88, 1956 (65–80). [Jap.e.*e.*]

A study of the bond, grade, and abrasive and grit size of various wheels in a standard bandsaw sharpener, the following being tested (data tabulated and graphed): roughness of the ground surface; weight of feather; grinding burn %; wear of wheel; and decrease of kerf width after sawing various species with teeth sharpened by various wheels.

3360. EDAMATSU, N., and OHIRA, Y. [**Studies on setting methods of bandsaw tooth (Report 2). On the sharpening of the set tooth.**] *Bull. For. Exp. Sta. Meguro, Tokyo* No. 87, 1956 (1–24). 5 refs. [Jap.e.]

[Cf. *F.A.* 18 Nos. 957–8.] A detailed investigation into the displacement of the tooth point and the decrease of set involved in various methods of automatic sharpening of swage-set saws with 3 types of swaging, and sprung-set saws with 4 different pairs (back and front) of side-clearance-angles, all saws having 'parrot' teeth.

823. Planing, Cutting of Mouldings. Chiselling, Mortising and Tenoning. Boring. Turning

See also No. 3348.

3361. PRUŠÁK, J. Teoretické podklady pro hodnocení trvanlivosti ostří. [**Theoretical bases for evaluating the service life of tool cutting-edges.**] *Drev. Výskum* 1 (1/2), 1956 (171–94). 2 refs. [Cz.cz.russ.g.] P.R.

Mathematical analysis of the process of woodworking with rotary tools for the purpose of evaluating the errors in the determination of the service-life between two sharpenings (T_i) (strictly speaking the net time of service, viz. up to the point when the maximum permissible unevenness of the worked surface is reached), the chip length (d), ridge

height (h_1) and the pitch between the ridges (f). When a series of consecutive circles is taken as the basis of approximate computation instead of the true cycloid curve, errors inherent in the former mathematical treatment can be evaluated for a given set of conditions. Thus, for a path of separation, $l = 500$ m., feed rate $s = 9{\cdot}5$ m./min., cutting speed $v = 26$ m./sec., chip thickness $h = 0{\cdot}5$ mm., and radius of 'great circle' (distance between the centre of the rotary block and the edge of the cutter) 62·5 mm., the calculated error values were: for T_l, 0·22%; for d, 11·21%; for h_1, 2·18%; and for f. 0%.

3362. **Knife-grinding bevels for various species and moisture contents.** *Wood-Worker, Indianap.* 74 (2), 1955 (32–3). P.R.

A table gives the values of grinding bevels and secondary bevels for the planer and moulder knives and for 13 American timber species (for 3 moisture-content ranges in most cases).

824. Forms of Joint. Jointing and Assembly

824.1. Nailed Joints

3363. BROCK, G. R. **The strength of nailed timber joints. Some effects of pre-drilling and clenching.** *Timb. Technol.* 64 (2199; 2200), 1956 (19–21; 74–7).

Presents the results of a laboratory investigation, and describes the method of making test joints and of testing.

3364. AHRENS, W. **The bending strength of nailed joints in beams.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 3308, 1956. pp. 4 + 2 dgms., 4 gphs., 1 tbl. 1 ref. Transl. by J. J. Mack and E. Bolza from *Bautechnik* [*Berlin*] 27 (1), 1950 (16–8). P.R.

3365. MÖHLER, K. Über einige Grundlagen und Entwicklungsmöglichkeiten des Holznagelbaues. **[Some principles and possibilities of nail-joint timber construction.]** *Holz Roh- u. Werkstoff* 13 (10), 1955 (388–97). [G.] P.R.

A brief account of three German DIN standards referring to nail-joint timber constructions and of the principles and importance of timber grading, with discussion on nails as load-carrying joint elements, comparison between nailed and bolted joints, and types of nailed-timber construction and probable future trends in nailed-joint construction.

3366. MASANI, N. J., and SHARMA, C. M. **How and why of nailed roof truss construction for residential and industrial buildings.** *Comp. Wood* 3 (2), 1956 (25–32). P.R.

Presents tabulated data on safe loads in double shear for nailed joints (2 nail sizes) and 8 different Indian wood species. The lateral strength of common wire nails is found to depend on: nail material, diameter, length, point, spacing, number of members in the joint, and moisture content. Full-size tests are described.

3367. BROCK, G. R. **The strength of nailed joints An investigation of the effect of the specific gravity of the timber and the size of nail used.** *Timb. Technol.* 63 (2194; 2195), 1955 (409–11; 466–9). 2 refs.

Round wire nails and *Pinus sylvestris* wood of different density and 16–18% moisture content were used in the tests. The results, presented in graphs and tables, showed that: (1) the stiffness (as indicated by loads to cause slips of 0·006 and 0·030 in.) and the strength (as indicated by the maximum load) of the joints are, for a given nail size, proportional to wood density; (2) the stiffness and strength of the joints are, for a given wood density, proportional to a power (between 1·25 and 2) of the nail diameter; and (3) the loads to cause the slips mentioned and the maximum load carried can be obtained from equations of the form $P = kGd^n$, where P is the load in lb., G is the density of the wood, d is the nail diameter, and k and n are constants. *From author's summary.*

824.6. Carpenters' and Joiners' Joints

3368. JESSOME, A. P. **The efficiency of scarf joints.** *Repr.* from *Canadian Woodworker, Toronto* June, 1956. pp. 4. P.R.

Tests made at the Ottawa Laboratory indicate that the notch effect set up by end steps reduced the efficiency of scarf joints by $\geqslant 40\%$.

824.8. Glues and Gluing

See also Nos. 3306, 3407, 3501.

3369. **List of publications on glue, glued products, and veneer.** *Rep. U.S. For. Prod. Lab., Madison* No. 513, 1956. pp. 22. P.R.

[Cf. *F.A.* 17 No. 3288.]

3370. HYLER, J. E. **Glues and gluing. Part 98.** *Sth. Lumberm.* 193 (2417–Christmas No.), 1956 (275 . . . 278).

Assembly work, gluing and finishing.

3371. BLOMQUIST, R. F. **Better glues.** *Sth. Lumberm.* 193 (2417), 1957 (43–7). 2 refs.

Discusses existing glues and desiderata for future development, research trends, better utilization and new products that might become practical through faster, cheaper and simpler gluing, and tabulates main general properties—mode of application and curing, working life, moisture resistance, cost etc. for various types of glues.

3372. ROBERTSON, J. E. **Cereal glue extenders.** *Veneers & Plyw.* 50 (2), 1956 (15, 38, 40). P.R.

To prevent losses from the use of unsuitable flour, specifications should be worked out covering the following properties of wheat flour used as an extender: grain size, water absorption, ash and protein content, colour, age of flour, viscosity when mixed with a certain % of glue, and catalysts. Some U.S. manufacturers have worked out their own specifications.

3373. HORIOKA, K., HORIIKE, K., and NOGUCHI, M. **[Researches for the improvement of wood (Rep. No. 3). Study on the mechanism of adhesion (Part 1).]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 89, 1956 (1–55). 30 refs. [Jap.jap.e.e.]

[Cf. *F.A.* 15 No. 4083.] Considers in mathematical and experimental detail the links, upon the weakest of which the breaking strength of bonded wood depends. These links are the cohesion (*a*) of the wood, (*b*) of the interface of the glue line and wood surface, and (*c*) of the glue line. Cohesion (*b*) is due to (1) mechanical bonding ('keying' of the wood surfaces by glue penetrating the pores, (2) specific adhesions of adhesive and adherend (van der Waals' force), and possibly (3) chemical bonding. Initial tests show that (3) contributes little, if anything to (*b*). Joints of end surfaces show superior mechanical bonding to those of radial surfaces. To effect improvements in manufacture it is important to locate the main seat of fracture in test-pieces, in which occurs the weakest link (*a*), (*b*) or (*c*), the distinction between the last two being particularly difficult to determine. By mixing a fluorescent material with the glue and photographing under ultra-violet light (coloured photographs given) this difficulty is removed and soundly based recommendations for improvement are possible (examples with urea resin are given). Secondary factors affecting (*b*)—viscosity, surface tension and wetness—are also investigated. The drop-size method for measuring the contact angle between wood and urea resin and phenol resin adhesives is illustrated, to show the greater usefulness of urea and the greater suitability of water as a solvent.

3374. Curry, W. T. **The strength properties of plywoods. Part 3. The influence of the adhesive.** *Bull. For. Prod. Res., Lond.* No. 39, 1957. pp. 27 + 7 photos. 17 refs. Price 2*s.* 6*d.*

[Cf. *F.A.* 16 No. 3469.] Tests on 5 constructions of plywood from Gaboon [*Aucoumea klaineana*] veneers ranging in thickness from $\frac{1}{10}$ to $\frac{1}{50}$ in. and bonded with a liquid phenolic resin, a urea resin or an animal glue, showed that the presence of the adhesive modifies the plywood structure by (1) compression of the wood close to the glue line and (2) impregnation of the wood cavities by the adhesive, to a degree independent of veneer thickness but varying with the adhesive. The greatest changes in structure were found in plywood bonded with phenolic resin and the least in that with animal glue. In the changes in strength accompanying structural changes, phenolic-bonded plywood developed the highest stresses. In both structural and strength changes, urea-bonded plywood was intermediate. From a comparison of test results and values calculated, using the equations previously developed for structural plywoods, it was found that the equations lead to considerable error when applied to plywoods of veneers $< \frac{1}{20}$ in. thick, but that reasonable accuracy can be obtained by treating such plywoods as a material comprising layers of wood separated by layers of a compressed impregnated wood. The extra data required are, however, not readily available and no alteration to the equations is suggested when treating normal plywood, where the influence of the glue line is small. *From author's summary.*

3375. Yamagishi, Y. **One method of testing glue joints of multi-layer plywood.** *Transactions of the 63rd Meeting of the Japanese Forestry Society, Meguro, Tokyo* 1954 (318–20). [Jap.?] From *abstr.* in *Rec. Res. Fac. Agric. Univ. Tokyo* No. 5, 1956 (69–70). [E.]

Illustrates the dimensions and shape of test pieces and the apparatus used when testing the glue joint by direct tension.

3376. Škripeň, J., and Dutko, P. Vplyv tvaru skúšobného telesa na šmykovú pevnosť lepených spojov dreva. **[Effect of test-piece shape on shear-strength values in glued wood joints.]** *Drev. Výskum* 1 (1/2), 1956 (51–68). 13 refs. [Slovak.slovak.russ.g.] P.R.

Reports on tests with double-shear test-pieces according to the current Czechoslovakian standard (ČSN), and with two types of single-shear test-pieces according to Soviet standard (GOST) and ASTM specifications. The species tested were Oak, Beech, Scots Pine and Spruce, and the glue was a phenol-resorcinol applied at 300 g./sq. m. The number of test-pieces for each series of tests (identical test-piece type and wood species) varied between 24 and 54, average 42. Before testing, the pieces were conditioned to attain a moisture content of 12%. Results of measurements were treated statistically, and the results are shown in table and graphs. In all cases, the lowest shear-strength values were obtained with the ČSN, higher ones with the GOST, and the highest with the ASTM test-pieces; these maximum values are considered to be nearest to the true strength value, the deviations from which can be explained by the existence of stresses normal to the glue-line sheared, these stresses being $\perp$ to the grain. The author recommends checking his results by carrying out another test with similar test-pieces made from isotropic materials.

3377. Clarke, J. T., and Nearn, W. T. **Factors affecting the quality of an epoxy resin wood-to-wood bond.** *For. Prod. J.* 7 (1), 1957 (20–7). 13 refs.

Reports on tests with an epoxy resin formulation, consisting of a resin and hardener capable of curing at room temperatures, as a bond for Maple laminae, investigating the effect of curing temperatures, rate of spread, assembly time and age of glue line on shear strength. The bond was considered satisfactory if curing time was at least one hour at temperatures $< 160°$ F., temperature being the most important factor affecting shear strength and wood failure at the glue line; the latter, however, never reached 50%. Ageing improved bonds cured at low temperatures. No water-resistant bond was produced.

3378. Lexa, J., and Škripeň, J. Vliv nízkých vytvrzovacích teplot na pevnost spoje lepeného fenolresorcinformaldehydovým lepidlem. **[Effect of hardening at low temperatures on the strength of bonds glued with a phenol-resorcinol-formaldehyde glue.]** *Drev. Výskum* 1 (1/2), 1956 (147–56 + 1 photo). 2 refs. [Cz.cz.russ.g.] P.R.

Test-pieces (GOST standard) made from Spruce wood and the FR-80 glue [Czechoslovakian] were kept in conditioning chambers at 5, 10, 15 and 20° C., and the shear strength determined after 8, 16, 24 hours, and 2, 3, 5, 8, 14 and 21 days. The loading

rate was 1250 kg./min. It was found that (1) strength increases with the time of hardening, and the slope of the strength curve depends on the temperature of hardening; (2) the ultimate strength does not depend on temperature and is equal to that of the solid wood; (3) pressing times were 3 days at 5°, 24 hours at 10° and 8 hours at 15° C.

3379. HORIOKA, K., and YAGISHITA, M. **[Studies on plywood. (Rep. No. 6). On the manufacturing method of no-void and no-overlap plywood.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 89, 1956 (151–72). 7 refs. [Jap.jap.e.e.]

[Cf. *F.A.* 15 No. 4152.] A study of core elongation caused by the spread of the glue and warp. Narrow core veneers must be joined in this type of manufacture (taping machine, tapeless veneer splicer, veneer edge gluer and G.F. edge gluing machine). The best of the variations in gluing methods studied is to spread the glue on the core, parallel to fibre direction or across it, rather than on the back and face in either direction.

3380. POUND, J. **Present-day applications of radio-frequency heating in woodworking.** *Wood* 22 (1), 1957 (10–4).

3381. FISCHER, F. Theorie und Praxis der Hochfrequenz-Verleimung: Kaurit HF Plv.—Kaurit K177—Kaurit K120/4. **[The theory and practice of H.F. gluing: Kaurit HF Plv.—Kaurit K177—Kaurit K120/4.]** *Holz Roh- u. Werkstoff* 14 (2), 1956 (55–8). [G.g.] P.R.

Contains instructions for the handling and use of these 3 glues and some data on the strength of the bonds obtained with them.

3382. KÜCH, W. Über die Wechselwirkung zwischen Holzschutzbehandlung und Verleimung. **[Interaction between preservative treatment and gluing of wood.]** *Holz Roh- u. Werkstoff* 14 (2), 1956 (58–67). 16 refs. [G.g.] P.R.

In order to determine (1) whether it is feasible to obtain durable glue joints, using conventional glues with preservative-treated wood, and (2) whether a subsequent preservative treatment is likely to affect the strength of joints, tests were carried out with 8 wood preservatives separately or in mixtures, and 10 different glues (casein and 9 synthetic-resin). Beech veneers were treated (by brush or soaking) with preservative, then air dried and glued to form plywood, after which the dry bond strength (DIN draft standard 53,251, 1951) was determined for the treated and the control plywoods. It was found that some combinations of preservatives with glues result in a considerable reduction in strength which, in the case of salts, may be due to a catalysing of the hardening process, but with oily preservatives might be caused by a change in the wettability of wood. It is thought that gluing after preservative treatment should not be practised in constructional work, but is quite practicable in cabinet-making, particularly when casein glue or a polyvinyl dispersion glue is used in combination with salt preservatives. In another series of tests, plywood test-pieces were treated with preservatives after gluing. Results here were much more encouraging, but with aqueous preservatives a reduction of bond strength generally occurred owing to swelling; glue-bond strength was hardly affected when plywood was impregnated with oily preservatives.

825. Cleaving. Adzing. Mechanical Comminution

3383. ALLOUARD, P. Fendage des bois à l'explosif. **[The use of explosives to split wood.]** *Bois For. Trop.* No. 51, 1957 (98–9). [F.]

Describes the methods used at an Ivory Coast pulpmill to split over-large logs by means of explosive wedges. [Cf. *F.A.* 15 No. 3639.]

826. Peeling. Slicing. Trimming, Edging etc. of Thin Sheets

See also Nos. 3405, 3497.

3384. **New plastic clips peel with the log.** *Wood, Chicago* 60 (8), 1955 (28). P.R.

End shakes or splits in veneer logs are now protected by styrene plastic clips inserted at alternate angles to the shake or split; the clips, $4\frac{1}{2} \times \frac{1}{4} \times 1\frac{3}{4}$ in., are provided with splines on both sides, preventing movement under the knife. The clips are said to increase work safety, reduce waste, and allow greater peeling speed; in slicing operations production may be doubled or trebled by clipping 2 or 3 cants together.

3385. KNIGHT, R. A. G., and NEWALL, R. J. **Shelliness in Gaboon veneer.** *Comp. Wood* 3 (5/6), 1956 (100–4). P.R.

Laboratory examination of a number of 'shelly' veneers (i.e. veneers splitting into two layers) indicated that a faulty combination of lathe settings, rather than some abnormality in the wood, was probably responsible. A certain combination of pressure bar and knife angle produced shelliness though not to the extent observed in the mill specimens.

827. Bending. Moulding (other than by Cutting)

3386. STEVENS, W. C., and TURNER, N. **'Springback' of laminated bends: the outward movement upon removal from the bending forms.** *Wood* 22 (2), 1957 (44–8). 1 ref.

Gives results of experiments on Beech and Oak bends with laminae of uniform thickness, made to determine the final radius of curvature after the instantaneous springback and subsequent creep (3 weeks at 70° F. and 60% humidity to maintain 12% m.c.). For practical purposes these movements are solely dependent on the number of laminae (n) and the approximate formula is

$$r = \frac{n^2}{n^2 - 1} r_1$$

where r is radius of final curvature and r_1 is radius of forming curvature. For Beech bends of total thickness 0·5 in. and 100 in. initial radius, the % radius change determined experimentally for 2, 3, 4 and 5 laminae was respectively 38, 11, 8 and 5, and by the formula 33, 12, 7 and 4.

829.1. Finishing

See also No. 3339.

3387. Crawford, I. A. **The bleaching of wood.** *Tech. Notes For. Comm.* (*Div. Wood Technol.*) *N.S.W.* 10 (1/2), 1956 (14–8).

Explains the need for bleaching, application, precautions and the make-up of 3 bleaching agents, and tabulates for 22 Australian species the original colour and the colours resulting from a first and second application of (*a*) a 2-solution bleach of concentrated ammonium hydroxide and 100 vol. H_2O_2, (*b*) 10% solution of hot oxalic acid, (*c*) NaClO at 12½% available Cl concentration.

3388. Hunt, D. L. **Plug that knothole and raise the grade.** *Wood, Chicago* 61 (4), 1956 (26, 28, 62). P.R.

An automatic machine for plugging furniture core stock, that can plug a hole in 4 seconds, is described. With the recent increase in price differentials between timber grades, the total cost (ca. $6,840) can be recouped in 5 years.

3389. Kirsch, A. J. **New approaches to wood finishing.** *For. Prod. J.* 6 (12), 1956 (500–4). 6 refs.

Discusses the relative merits in application, appearance and wearing properties, of varnishes, lacquers etc., and describes (1) the use of transparent overlay papers impregnated with resins, (2) the direct use of polyester-vehicle resins, both of which are considering promising for mass production, and as having excellent surface properties.

83. Timber Manufacturing Industries and Products. Uses of Wood as Such

3390. Jenkins, J. H. **Report of a visit to Russia's forest industries.** *Repr.* from *Canada Lumberman* [*Toronto*] Nov., 1956. pp. [6].

Notes on forest areas, commercial species, organization of production, output and requirements, working conditions and equipment.

831. Fuelwood and Various Types of Rough Timber

See Nos. 2681, 3305, 3343, 3352, 3416–7, 3438–45, 3474.

832. Mills, Their Functions and Products

3391. Es. Brandgefahren und Brandschutz in Spänebunkern. **[Fire danger and fire protection in the storage of chips and wood dust.]** *Holz- Zbl.* 83 (8), 1957 (70). [G.]

A general article on the dangers of fires and dust explosions and their prevention, describing a built-in installation for storage bunkers, using atomizing nozzles arranged to spray the whole surface of the chips, and other equipment.

832.1. Sawmills and Planing Mills

See also Nos. 3180, 3258, 3261, 3348, 3351–62, 3424–5.

3392. Sunley, J. G. **Conversion and grading of timber in Scandinavia and Finland.** *Aust. Timb. J.* 22 (11), 1957 (69 . . . 91). 6 refs.

Conversion, barking, log sorting, frame and circular sawing, shrinkage allowances, quality grading for export, grading for home consumption, stress grading and utilization of waste are covered.

3393. Eisbacher, H. Schwedens grösstes Sägewerk. **[Sweden's largest sawmill.]** *Holz-Kurier, Wien* 12 (1), 1957 (5–7). [G.]

A description of the Kästet sawmill of the Korsnäs A.B. on Gävle bight, describing the highly mechanized and automatic barking, sorting and storage installations, the sawing and sorting of boards, centrifugal pre-drying before kiln drying etc. The very low sawn utilization % (46) is due chiefly to the small size of the timber, but slabs are chipped for pulping at a mill near by.

3394. Hasek, V. C. **Report to the Government of the Sudan on sawmilling.** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 554, 1956. pp. 77 + 16 dgms., 8 photos. Limited distribution.

The terms of reference of the inquiry were: (1) suitability and condition of existing equipment; (2) possible economies from replacement by more modern machines; (3) policy for replacement; (4) minimum technical staff required to operate and maintain the sawmills.

3395. Hyler, J. E. **Modern sawmilling. Parts 59–64.** *Sth. Lumberm.* 193 (2417—Christmas No.), 1956 (291 . . . 296); 194 (2417; 2419–2422), 1957 (53 . . . 58; 37 . . . 44; 43 . . . 46; 45 . . . 48; 49–50).

Power systems, including air compressors, and power transmission. Waste disposal.

3396. Malcolm, F. B. **A simplified procedure for developing grade lumber from hardwood logs.** *Timber of Canada* 18 (2; 3), 1957 (21–2, 24, 27, 34; 26 . . . 32). 1 ref.

The first part is a detailed, illustrated account of the best method of selecting the sawing faces of the log and of subsequent sawing to locate the defects at the edges or corners where they can be edged off, so producing greater volumes of higher grades. The second part covers logs with specific defects (sweep, spiral and straight seams, rot and wormholes).

3397. Schnittholz als Bau- und Werkstoff. **[Sawn timber in building and manufacture.]** *Holz-Zbl.* 83 (32/33), 1957 (407 . . . 444). Many refs. [G.]

Contains articles on: the development of sawn timber production in W. Germany (*E. Kussmann*); Noise abatement and acoustics (*J. Wiedefeld*) [including outside screens at roof height against aircraft noise]; and articles on the use of sawn wood in the vehicle, agricultural machinery, pattern, and coffin industries, the use of tropical timber etc.

832.2. Veneer and Plywood Mills, including the Manufacture of Composite-Wood Assemblies

See also Nos. 3309, 3369 *et seq.*, 3384–6, 3413, 3419, 3423, 3448–9.

3398. **[Pacific Coast plywood industry.]** *Timberman* 58 (1 *B*), 1957 (66–223).

This issue covers production and sales for the

record year 1956, new applications in schools, church and home building, industrial, agricultural, marine and speciality applications, and cost and quality control, with directories of Pacific Coast plywood and N. American particle-board manufacturers.

3399. PETIT, T. A. **Some economic characteristics of the Pacific coast softwood plywood industry.** *J. For.* 55 (2), 1957 (124–9).

Aspects discussed are organization, production techniques and costs; supply, demand and distribution of the raw material; and the determination of the market price of plywood.

3400. PERRY, T. D. **Seventy-five years of plywood.** *Sth. Lumberm.* 193 (2417—Christmas No.), 1956 (280 . . 290).

A history of techniques and applications, woods and glues used, etc.

3401. NARAYANAMURTI, D. **Composite wood timbers: *Picea morinda* (*Picea smithiana*)—Spruce.** *Comp. Wood* 3 (3), 1956 (51–8). 19 refs. P.R.

3402. **Veneer and plywood from N.S.W. scrub-woods.** *Aust. Timb. J.* 22 (10), 1956 (1099 . . . 1114).

Describes their harvesting and manufacture from 'scrub' [rain-forest] species (listed). In one contract all species down to 3·5 ft. mid-girth must be taken, a mobile lathe removing the available veneer from the poorer logs in the logging area. Block-stacked · diffusion impregnation, a C.S.I.R.O. screened veneer drier, and an electronic tapeless splicer are used.

3403. WAGENHOFF, A. Erfahrungen über die Aushaltung und den Verkauf von Oliveneschen. **[Experiences with 'Olive' Ash: laying off and sale of logs.]** *Forstarchiv* 25 (12), 1954 (273–5). 4 refs. [G.]

Ash that has a figure in the heartwood similar to that of Olive is now in demand for veneer. The requisite qualities are described, and a guide is given for the recognition of logs suitable for veneer.

3404. SCHULZ, H. Über den Einfluss von Fehlern des Stammholzes auf die Furniertauglichkeit der Eiche. **[The effect of stem defects of Oak on its suitability for veneer.]** *Abstr. of thesis*, in *Forsch. u. Berat. (Forstw.) Landesaussch. landw. Forsch. Landes Nordrhein—Westfalen* No. 2, 1956 (52–4). [G.]

Discusses knots, bark pockets, mechanical injuries and spiral grain and their outward signs (often difficult to recognize and evaluate) and the effect of extent and position of defects [cf. *F.A.* 18 No. 2249].

3405. BAUER, F. Die Roteiche im praktischen Messerfurnier-Versuch. **[Practical tests in slicing *Quercus borealis* for veneer.]** *Holz-Zbl.* 83 (16), 1957 (183–5). 4 refs. [G.g.]

Tests with 4 medium-quality German-grown stems aged 65–103 years, having mid-diameters of 38–49 cm. and widely differing mean ring widths and growth patterns, showed that sliced veneers cut after varying periods of steaming were suitable for plywood and furniture and better than rotary-cut veneers of this species, but inferior to good White Oak. To avoid splits and shakes in steaming, stems should be 100 years old or more.

3406. KUMAR, V. B. **Statistical quality control in wood industries: Part I—The veneer drier.** *Comp. Wood* 3 (2), 1956 (37–40). 9 refs. P.R.

Describes the application of the Shewhart control chart for a roller-type veneer drier in a plywood factory: while the range of m.c. was mostly under control, the mean value went out of control quite frequently. Means of correcting this are discussed.

3407. NORTHCOTT, P. C. **The effect of dryer temperatures upon the gluing properties of Douglas-Fir veneer.** *For. Prod. J.* 7 (1), 1957 (10–6). 6 refs.

Describes a series of laboratory and factory trials of severe and prolonged drying schedules involving temperatures up to 543° F., supplemented by microscopic examinations. Excessive temperatures or periods apparently reduced the strength of phenolic-resin bonds, as expressed in a reduction in the % of wood failure in cleavage tests. From microscopic examination, however, it is concluded that this phenomenon was not due to a loss of adhesion or cohesive strength of the glue, but to a reduction in the strength of the wood. This reduction is assumed to be greatest in the surface fibres of the veneers, the extremely shallow wood failure so resulting giving the impression of glue failure. Veneers from some trees are much more severely degraded by severe drying schedules than those from others, but there was no significant difference for trees from different localities. [No distinction between heartwood and sapwood is made.] [Cf. *F.A.* 16 No. 2269.]

3408. GOTTSTEIN, J. W. **An effect of peeler log heating on the subsequent shrinkage of veneers during drying.** *Comp. Wood* 3 (5/6), 1956 (105–9). 6 refs. P.R.

In the case of Eucalypts susceptible to collapse, it was found that the heating of veneer logs to facilitate peeling may cause a significant increase in shrinkage of veneers over a wide range of drying conditions.

3409. ENGLESSON, T. **Efficiency in plywood manufacture.** New Zealand Forest Service, Wellington. [1956.] pp. 7. 2 refs. Transl. from *Pap. ja Puu* 38 (3), 1956 (89–95). [See *F.A.* 17 No. 4468.]

3410. RAUCH, A. H. **Identification of exterior plywood.** *For. Prod. J.* 6 (12), 1956 (497–99).

Of various methods used for distinguishing between exterior and interior grades of plywood, diagonal incisions of the core veneers dyed with red ink, seemed the most promising, as even on small pieces one or more red marks will show on the edges. The small incisions do not affect strength.

3411. NEWALL, R. J. **Corrugations on veneered plywood.** *Wood* 22 (3), 1957 (84–8). 1 ref.

These are associated with (*a*) lathe checks in the surface ply of the underlay, the defect being influenced by (*b*) moisture content, (*c*) thickness, (*d*) species, (*e*) care in peeling, (*f*) the final thickness of the overlay veneer. Material with (*a*) should be covered with a veneer of $\leq$ 0·7 mm. final thickness

or have a cross-band ply interposed. The minimum m.c. allowable depends on (*c*), (*d*) and (*f*). Loosely peeled Beech, 1·5 and 3 mm. thick, veneered with 0·4- and 0·6-mm. material, has corrugated at changes in m.c. between 2 and 3%, but with thicker veneer and thinner underlays, corrugation has been negligible. Where (*c*) = (*f*), (*d*) is the same, and (*a*) is absent, a 10% change in m.c. has not resulted in corrugation. [Cf. *F.A.* 15 No. 1883.]

3412. MARIAN, J. E., and SUCHSLAND, O. **Waviness of lumber- and chipcore board: an investigation of the factors affecting surface stability.** *Pap. ja Puu* 38 (6/7), 1956 (291–302). 12 refs. [E.e.] P.R.

The main cause of surface unevenness of laminated panels is dimensional variation in the core caused by changes in temperature and moisture content of the air, and by changes in the glue line. Recommendations for reducing this include leaving core strips unglued, grooving, decreasing core-strip width, and using cores of re-aggregated wood. A method of measuring unevenness before and after changes of humidity, from reflected mirror images of linear patterns, and another for producing arbitrary waviness in experimental panels, are described.

833. Timber in Buildings and Engineering Structures (Manufacture and Use)

833.1. Building Components and Fittings: General

See also No. 3364–6.

3413. MICHNIEWICZ, W. **Economy in the use of timber in building [in Poland].** *Timb. Technol.* 63 (2193), 1955 (355–6). Transl. from *Konstrukcje Budowlane i Inżynierskie* [*Poland*].

(1) The 'Imperkol' gluing method [cf. *F.A.* 17 No. 4450]; (2) types of glue and method of application; (3) types of laminated wood members used; (4) types of joint between inclined members; (5) economy in formwork; and (6) factors of safety.

3414. **A structural review of the T.D.A. rigid frame system.** *Timb. Technol.* 63 (2193), 1955 (363–4).

Describes timber arches consisting of 8 members. They are light and strong, and require no special tools for their erection. They are designed in the first place for farm buildings, such as barns. A table of timber dimensions is given for different arch sizes.

833.2. Special Uses in Residential, Commercial and Public Buildings

3415. SCHÜLE, W. Warm wohnen durch Holz. **[Wood for warm houses.]** *Holz-Zbl.* 83 (27), 1957 (349). [G.]

Contains a table and graphs showing the thermal properties for various constructions, particularly floorings, of wood and/or insulation boards.

833.8. Wood in Hydraulic, River and Marine Uses

3416. COTTON, K. E. **The use of timber in the construction of sea defence and river works [with discussion].** *Rec.* [*6th*] *Conv. Brit. Wood Pres. Ass.* [1956] (5–43).

Experience and practice in constructing and maintaining sea and river defences on a length of the East Coast between Hunstanton and Felixstowe, and the rivers and broads to the west of it, with comments on the properties of the timbers used.

3417. MANN, R. H. **Wood jackets save concrete piles.** *Wood Pres. News* 35 (1), 1957 (12–4). P.R.

Recent inspection by the American Wood Preservers' Institute showed that, with very few exceptions, some 6000 concrete piles in salt water along the Long Island shore (N.Y.), protected with creosoted planks, are in good condition. Many unprotected piles in other marine constructions showed serious disintegration after comparable service periods.

833.9. Miscellaneous

3418. SALLENAVE, P. Une grande victoire du bois: le nouveau métro roule sur rail en azobé. **[A great triumph for wood: the new Paris underground railway runs on rails of *Lophira alata*.]** *Bois For. Trop.* No. 51, 1957 (52–8). [F.e.span.]

A revolutionary experiment is being made on one of the lines of the Paris Métro (Line 11 Châtelet-Mairie des Lilas) where trains with pneumatic tyres are running on wooden rails made of Azobé [*Lophira alata*] from Cameroun. The new trains are fast, light in weight, capacious, smooth-running and practically noiseless. Various substances were tested for rolling surface (concrete, bituminized surfaces, profiled steel) but wood alone gave complete satisfaction—negligible wear after 200,000 km., perfect electric insulation, easy assembly and dismantling, and low cost. The design of the new rolling stock, design and manufacture of the rails, and the supply of suitable timber are described and discussed, with photographs.

834. Shingles. Cooperage. Packing Containers. (Manufacture and Use)

See No. 3352.

835. Industrial and Domestic (Utility) Woodware. Toys and Models. Sports and Recreational Goods. Musical, Scientific and Mathematical Instruments. Surgical Applications etc.

3419. NARAYANAMURTI, D. **Laminated skis.** *Comp. Wood* 3 (2), 1956 (33–6). 6 refs. P.R.

Describes a method of manufacturing laminated skis from Indian woods (*Canarium strictum, Dysoxylum malabaricum,* and a mixture of *C. strictum, Dalbergia sissoo* and Bamboo).

3420. PEARSON, F. G. O., and WEBSTER, C. **Timbers used in the musical instruments industry.** Forest Products Research Laboratory, Princes Risborough. 1956. pp. 47.

Presents results of an investigation on methods and choice of woods in this U.K. industry under the headings: pianos; organs; stringed instruments; woodwind instruments; percussion instruments; classical instruments; seasoning; and glues. There is an index to the timbers under their trade names.

836. Furniture and Cabinet-Making. Carving. Marquetry. Wooden Ornaments

See No. 3500.

838. Vehicles (including Ships, Boats, Aircraft)

See also No. 3452.

3421. PEARSON, F. G. O., and THOMAS, A. V. **Timbers used in the building and repair of railway rolling stock.** Forest Products Research Laboratory, Princes Risborough. 1956. pp. 12.

Summarizes information derived from visits to firms engaged in building or repairing rolling stock and to depots of the British Transport Commission and the London Transport Executive.

3422. WOODS, R. P. **Timbers for motor body building.** *Timb. Technol.* 63 (2191), 1955 (252–3).

The tables presented contain strength data for Beech, 7 African and 4 South American species; the tropical woods seem promising as substitutes for Oak and Ash, data for which are also tabulated.

3423. BESSET, J. L'emploi du contreplaqué dans la construction navale. **[Use of plywood in boat and shipbuilding.]** *Rev. Bois Appl.* 11 (11), 1956 (22–6). [F.]

Describes the merits of plywood in these industries, the requirements to be met, and, in some detail, its application in the construction of large ships and small craft, such as canoes and dinghies.

839.8. Industrial Waste Wood, its Processing and Uses

See also Nos. 3305, 3391, 3395, 3497, 3506, 3509.

3424. SIMMONS, F. C. **Sawmill residues. Their production and use in the Northeast.** *Sth. Lumberm.* 193 (2417—Christmas No.), 1956 (204–7).

Compares the waste/lumber ratio for various types of log as between California band-mills and the Northeastern circular mills, and gives data on the amounts of various types of waste, sawdust, shavings, slabs, trim etc. from various species and their use for such purposes as stable litter, fuel, charcoal, pulp, chipboards etc.

3425. CORDER, S. E. **Oregon mill residues in 1953.** *Inform. Circ. Ore. For. Prod. Lab.* No. 7, 1956. pp. 32. 7 refs.

A survey of waste wood in sawmills and plywood mills showed an annual unused residue of 1¾ million tons. Use of this for pulp and fibreboard is increasing.

84. Preservation and Other Treatments to Improve the Properties of Wood. Damage by Biological Agencies and its Control. Seasoning. Timberyard Practice

841. Wood Preservation

See also No. 3382.

3426. **Timber preservation.** British Wood Preserving Association and Timber Development Association, London. [1957?] pp. 79. 51 refs.

Discusses the treatment of timber before use, under the main headings: uses of treated timbers, causes of deterioration, methods of testing preservatives, types of preservative, preparation of timber, methods of application, factors affecting penetration, and properties of treated timber. An appendix lists commercial preservatives showing their uses, method of application, recommended absorptions etc., and suppliers in the U.K.

3427. BAVENDAMM, W., and BELLMANN, H. Holzschutzmittel. Steinkohlenteeröl. **[Wood preservatives. Creosote.]** *Holz Roh- u. Werkstoff* 13 (12), 1955 (485–8). 23 refs. [G.] P.R.

Gives its chemical characteristics, composition and properties, activity, and uses.

3428. BAVENDAMM, W. Überblick über die Holzschutzpatente der Bundesrepublik Deutschland im zweiten Halbjahr 1956. **[Western German wood-preservation patents of the second half of 1956.]** *Holz-Zbl.* 83 (12), 1957 (129). [G.]

Includes: *German Patent* No. 946846 (*Rütgerswerke A.G.*), a preservative dressing for use on the top end of transmission poles etc., a paste of 'oxidized pitch', fibrous filler, at least 5% bases of low water-solubility and high boiling point derived from creosote or crude oil, and a diluent of low boiling point, the whole forming a durable source of slowly diffusing preservatives, also two patents for improved devices for applying such dressings; No. 948,556 (*Farbenfabriken Bayer A.G.*), for 1-cycloalkylidene-2-cycloalkylketones, their isomers, homologues, and hydration products, as fungicidal and insectidal wood preservatives. It is claimed that these preparations penetrate easily, are lasting, do not harm the wood or affect its paintability, are miscible with other preservatives and many solvents, and can be used in all known impregnation processes. No. 950,966 (same patentee) an improved treatment for cut surfaces, to control tylose formation in newly felled hardwoods, particularly Beech. No. 947,202 (*Rudolf Heusel, Hamburg*) a fire-retardant paint, for use on wood and other materials, containing pulverized SiC, asbestos and/or graphite.

3429. BULTMAN, J. D., LITTLE, R. N., and LEONARD, J. M. **A field evaluation of termite repellents.** *NRL Report, Naval Research Laboratory, Washington, D.C.* No. 4620, 1955. pp. 9.

Wooden panels impregnated with 37 chemical agents were subjected to attack by termites in the Panama jungle for a period of 22–30 months. Impregnation was carried out by both high pressure and immersion, the level of impregnation varying from 0·8 to 5%. Of the compounds tested, PCP, Cu and Zn PCP naphthenate, hexachlorophenol, Zn dithiocarbamate, creosote fortified with intermediate boiling fractions, creosote residue, creosote minus the tar acids and tar bases, and creosote minus the tar bases, in that order, were the most effective in repelling termite attack.

3430. LEDVINA, M., and ČERMÁK, J. Použití arsenových preparátů k ochraně dřeva. **[Use of arsenicals for wood preservation.]** *Drev. Výskum* 1 (1/2), 1956 (113–26). 12 refs. [Cz.cz.russ.g.] P.R.

A new preservative, '100/2', which is a 15% aqueous solution of $Ca_3(AsS_3)_2$ with an excess of

CaS and CaH_2S_2, was tested in the Březnice laboratory of the Czechoslovak Research Institute of Timber Industry Technology. [Impregnation methods are not mentioned.] It is miscible with water in all proportions, does not corrode iron, does not increase inflammability, hygroscopicity, or water absorption, and does not impair the mechanical and electrical properties of the timber, which can be painted, glued and worked, and is suitable for agricultural and horticultural uses. The new preservative penetrates better into refractory woods than oily preservatives or $HgCl_2$. It possesses a relatively high toxic effect (much as Boliden salt) and low leachability. It has been in industrial use since 1953.

3431. HOUTMAN, J. P. W., BRUIJN, J. A. DE, and DIJKHUIZEN, H. **Colloidal solutions for timber preservation.** *Timb. Technol.* 64 (2200), 1956 (87). 5 refs.

Graveyard tests with Balsa, Djeundjing, Keruing and Damar and different kinds of Cu in colloidal form (emulsions of Cu naphthenate, stabilized by Turkey-red oil; Cu hydroxide or basic Cu sulphate, stabilized by gelatin or gum arabic) showed that the preservation of wood by means of colloidal solutions is only possible when the size of the particles is much below 2 μ and when the solutions are stable in contact with the wood. Basic Cu compounds seem to have different toxicity in the colloidal and dry form, and to act selectively against different fungi.

3432. KININMONTH, J. A. **Kiln drying pressure treated Radiata Pine.** *N.Z. Timb. J.* 3 (5), 1957 (41–3).

Tabulates data to show the extra time required for drying 4 × 1 and 4 × 2 in. stock impregnated by the full-cell process with 3 Cr formulations. The best way of shortening this time is apparently to use a treating schedule giving complete sapwood penetration with as low liquid absorption [retention?] as possible, i.e. using high concentrations.

3433. RUBEŠ, V. Fysikální úvahy o impregnaci. **[Physical considerations in impregnation.]** *Drev. Výskum* 1 (1/2), 1956 (127–40). 4 refs. [Cz.cz.russ.g.] P.R.

Aqueous preservatives, into some of which fine suspensions had been introduced, were forced through cylindrical Beech test-pieces, and the effect of the pressure, cylinder length, and dispersed particles was evaluated on the basis of the Poiseuille equation. The marked retardation in the passage of solutions caused by dispersed particles was matched by aqueous solutions of surfactants, a 0·4% solution being the most retardant. In the presence of dispersed particles the drop in the rate of passage of water increased from 5·6 to 92·2% of the 10-min., hydrostatic pressure at 0·5 atm.

3434. WILSON, W. J. **O.P.M.—a new method of wood impregnation.** *N.Z. Timb. J.* 3 (4), 1956 (32–3).

Covers the fundamentals of the oscillating-pressure method [cf. *F.A.* 17 No. 2110; 18 No. 2207], the plant, impregnation process, merits, and possible value to New Zealand. Wood need not be seasoned before treatment.

3435. Holzschutz am Schlagort. **[Wood preservation on the felling site.]** *Holz-Kurier, Wien* 12 (6), 1957 (6). [G.]

Describes a portable installation for the impregnation of poles by the Boucherie system, used by an Austrian firm. The trees are treated horizontally, up to 150 at a time, by means of tight-fitting pressure heads through which the preservative is forced into the tree to displace the sap, at a pressure difference of ca. 1 atm. generated in a pressure chamber either by hand pump or by compressed air. Wolman UA salts in concentrations of 0·75 to 2% are used at 6–7 kg./tree.

3436. BECKER, G., and STARFINGER, K. Studien über die Flüssigkeitsaufnahme beim Tauchen von Holz. 1.–3. Mitteilung. **[Investigations on the uptake of liquids by wood when immersed. Parts 1–3.]** *Holz Roh- u. Werkstoff* 13 (12), 1955 (462–7; 14 (1; 3), 1956 (1–8; 95–100). 34 refs. [G.g.] P.R.

1. *Effect of duration of immersion and repeated immersion.* Tests were made with standard blocks (5 × 2·5 × 1·5 cm., these dimensions corresponding to the fibre, ray, and growth-ring directions respectively) cut from *Pinus sylvestris* sapwood (*A*) and from *Picea abies* (*B*), chiefly from the peripheral portion of the stem. Most of the blocks were planed. They were stored for a long period at ca. 20° C. and 65–70% relative humidity, and the smallest faces then sealed with paraffin wax, thus leaving an area of 40 sq. cm. for penetration. The following preservatives and fire retardants were used: $MgSiF_6$, $ZnSiF_6$ alone or in mixtures, PCP (Na salt), sparingly soluble (U) salts, different salt mixtures and fire retardants, also $NaHF_2$, creosote, and chloronaphthalene preparations. Increase of the time of immersion from 5 sec. to 1 min. caused an absorption increase of 40% in *A* for aqueous solutions (a.s.), 20% in *A* for oily solutions (o.s.) and in *B* for (a.s.), and of 10% in *B* for o.s. The amount of absorbed preservative was doubled after ca. 10 min. for *A* with a.s., ca. 15–20% for *A* with o.s. and *B* with a.s., and after 1–2 hours for *B* with o.s. When, after the evaporation of water absorbed during the first brief treatment, the wood was given a second treatment with a.s., the amount of liquid absorbed was roughly equal to that absorbed in the first; for oils, it was 40–80% of the first.

2. *Effect of wood properties and species.* With the same material the coefficient of variation of uptake was 12–15% for a 5-sec. immersion, but the maximum variance was often 1½–3 times the minimum value. The magnitude of the natural dispersion of values did not seem to depend on either the species (Pine vs. Spruce) or the class of preservative (aqueous vs. oily). The coefficient of variation of the mean values for a class of preservatives were: for Pine sapwood (s.w.) and aqueous solutions (a.s.), 14%; Spruce and a.s., 16%; Pine s.w. and oils, 21%, and Spruce and oils 28%. For a 5-sec. immersion there was practically no difference in uptake between the ray and growth-ring direction; for immersion periods > 1 min. the uptake of some oils was markedly greater for Pine s.w. in the ray than in the growth-ring direction, whereas no such differences were

found in Spruce for immersion times up to ca. 1 hour. The uptake in short immersions usually decreased as wood density increased. Unplaned wood absorbed ca. twice as much liquid as planed wood. Up to a 1–2 min. immersion period the uptake of Spruce was greater than Pine s.w.; the relationship was reversed for longer immersion periods.

3. *Effect of properties of the preservatives.* With the same material, no clear-cut effect of salt concentration on the amount of uptake was found; on the other hand, wettability appeared to increase uptake. With oils, the uptake during short immersion increased with their specific gravity; oils of higher viscosity adhered in greater quantities to the wood; the uptake of hydrocarbons was less than that of chlorinated naphthalenes or creosotes. With 5-sec. immersion the over-all mean uptake for salt solutions was ca. 80 g./sq. m. of surface, for oils 100 g./sq. m.; with two 5-sec. immersions, 160 g./sq. m. for both.

3437. RUBEŠ, V. Impregnace v parní fázi. **[Vapour impregnation.]** *Drev. Výskum* 1 (1/2), 1956 (141–6). 7 refs. [Cz.cz.russ.g.] P.R.

Describes preliminary (unsatisfactory) results of impregnating Beech and Spruce heartwood with xylenol/water-vapour mixture at temperatures > 100° C. The requirements for a preservative to be applied in this way are that it should be highly toxic, should distil with steam, boil below 180° C. and combine with the wood substance.

3438. MAY, K. L. **Preservation, inspection and maintenance of transmission poles [with discussion].** *Rec.* [*6th*] *Conv. Brit. Wood Pres. Ass.* [1956] (178–95).

3439. Neues vom Mastenschutz. **[New developments in the preservation of transmission poles.]** *Holz-Zbl.* 83 (19), 1957 (227–8). [G.]

Describes (*a*) a system of 3-zonal treatment using bituminized paper collars fastened round the pole at the top, middle and base, into which UA pastes (different pastes for original and after-treatments) are introduced, (*b*) a deep-injection system used by itself or in addition to pressure treatments, and (*c*) a hand injection tool for use on standing poles and a machine for the simultaneous injection of batches of poles fed through on a carriage.

3440. SEDZIAK, H. P. **Penetration and exudation of oil in sections of Pine poles treated with creosote-pentachlorophenol mixtures.** *Rep. For. Br. Can.* No. *O*-175, 1956. pp. 17. 1 ref. P.R.

Test results are tabulated for pressure treatment of *Pinus banksiana* and *P. resinosa* pole stubs with 4 different 'light' creosotes containing 2% PCP, and 4 different treating cycles. It seems that there is no single remedy to ensure that treated material stays clean, but pre-steaming seems to be the most effective measure. *P. resinosa* bled less than *P. banksiana.* The amount of bleeding was little affected by sapwood thickness, moisture content, the 2% PCP present, the amount of preservative retained, or wood-structure differences in individual poles.

3441. WALTERS, C. S., and PETERSON, K. R. **Report on Project 301-A. Preservative treatment on fence-posts by cold-soaking in pentachlorophenol fuel-oil solutions.** *For. Note Ill. agric. Exp. Sta.* No. 70, 1957. pp. 4. [Cf. *F.A.* 17 No. 3374.]

3442. TUCHSCHMID, A., and SCHLUMPF, A. Über die Dauerhaftigkeit von Pfählen. **[On the durability of fence posts.]** *Schweiz. Z. Forstw.* 108 (1), 1957 (60–1). [G.]

Posts of dry or green wood of Silver Fir or Spruce, 6–8 cm. in diameter, treated by various methods, were examined after 2½ years' burial in a light forest soil. Immersion in creosote for 3 hours gave little protection, but steeping for 3 days gave good protection. Painting with the wood preservative Cunatol gave good results at small cost. Dry posts proved more durable than green ones.

3443. ST. GEORGE, R. A. **Protecting log cabins, rustic work, and unseasoned wood from injurious insects in Eastern United States.** *Fmrs'. Bull. U.S. Dep. Agric.* No. 2104, 1956. pp. 18. 10 refs.

Supersedes *Fmrs'. Bull. U.S. Dep. Agric.* No. 1582 [cf. *F.A.* 4 p. 116]. Gives information on classes of insects and damage, preventive measures, and preservative treatment, including after-treatment.

3444. BOWERS, E. A. **Service tests of preservative treated rail sleepers.** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 225, 1956 (1–2, 7).

The average service life of the 71 million sleepers laid in Australia has fallen to ca. 19 years. Untreated Box, Ironbark, River Red Gum and many others are good for 20. Peppermint, Silvertop Ash and Manna Gum untreated have an expected life of 6–15 years; creosoted Radiata Pine has lasted 20. The high-pressure treatment and incising of hardwoods and tests with various preservatives are outlined.

3445. **Summary of rail sleeper tests.** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 227, 1957 (3–4). 1 ref.

Tabulates under railway, locality, and species, the numbers under test and treatment in the 13 tests referred to. [See preceding abstract.]

3446. KLEM, G. G. Ny metode for utsetting av prøver på impregneringsfelter. **[A new method of disposing test specimens in 'graveyard' tests of preservatives.]** *Norsk Skogbr.* 3 (3), 1957 (75–6). [Nor.]

Instead of being buried to half their length, specimens are laid on the earth so that the whole of one side is in contact with the soil. By this method specimens can be examined and replaced easily and quickly, and parallel trials by Det norske Skogforsøksvesen over several years show that decay in control specimens is as severe as when samples are partly buried. The Skogforsøksvesen will in future use the new method.

3447. CARTER, E. P. **Preliminary report on an accelerated soil burial test method for evaluating the effectiveness of proprietary wood preservatives applied by non-pressure methods.** *For. Prod. J.* 7 (1), 1957 (27–31). 17 refs.

A tentative, accelerated soil contact test method is described, for evaluating the effectiveness of proprietary wood preservatives and non-pressure methods of application such as might be employed by the householder or farmer for the protection of wood to be placed in contact with the soil. Test-pieces of Ponderosa or Sugar Pine, treated with 4 proprietary preservatives by coating, spraying, dipping, cold soaks, or hot and cold baths, were evaluated (visually and by weight loss) after one year's burial in an inoculated soil/sawdust mixture. Zn- and Cu-naphthenate-based preparations were satisfactory by all methods, T.C.P. required long soaks or hot and cold baths, and a rosin preparation was ineffective.

842. Treatments to Improve the Resistance of Wood to Physical and Chemical Agencies other than Fire

3448. SAMEK, J. Rozměrová stabilita dřeva, bakelisovaného kresolformaldehydovou pryskyřicí. **[Dimensional stability of wood impregnated with cresol-formaldehyde resin.]** *Drev. Výskum* 1 (1/2), 1956 (157–69). [Cz.cz.russ.g.] P.R.

Beech and Poplar test-pieces 100 × 20 × 2·5 mm. (grain direction longitudinal) were immersed for 15 hours in solutions (20, 30 and 40% by weight) of the resol [resin in soluble condition] then air-dried for 12 hours and kiln-dried, together with controls, at 150° C. for 2·5 hours, and finally both sets soaked in water for ½ to 169 hours. The decrease of tangential swelling compared with controls was ca. 33% for Beech and 50% for Poplar; the impregnation also substantially retarded the rate of swelling. In both respects the 30% resol was best; no difference was observed in shrinkage between the impregnated wood and controls.

The highest dimensional stability is obtained in improved wood when the adjacent laminae are crossbanded: in the plane of the laminae the maximum swelling is $\geq 0{\cdot}04$–$0{\cdot}32$%, while at right angles to that plane, swelling depends largely on the material of the laminae. When the laminae are not pre-compressed, swelling can amount to 4–7%; with pre-compression the swelling is at first almost imperceptible but after prolonged exposure reaches 15–35%. If the individual laminae are both impregnated with resin and pre-compressed, their dimensional stability at right angles to the laminae is almost absolute. Such wood should not, however, be used in water if > 3% swelling is not permissible. The rate of shrinkage was almost the same for wood treated with the 3 concentrations of resin used.

3449. HIRAI, S., and ISHIHARA, H. **Properties of high-density plywood.** *Transactions of the 63rd Meeting of the Japanese Forestry Society, Meguro, Tokyo* 1954 (320–1). [Jap.?] From abstr. in *Rec. Res. Fac. Agric. Univ. Tokyo* No. 5, 1956 (69). [E.]

In trials with 3-ply rotary-cut *Fagus crenata* and phenol-formalin resin solution in methanol, (1) tensile strength did and adhesive strength did not increase with increased pressing time, (2) tensile strength and sp. gr. increased with increasing pressure and adhesive strength did so slightly, (3) the increased water absorption with increasing veneer thickness was clearly due to the influence of the resin content.

843. Fireproofing and Fire Resistance

See also Nos. 3304, 3499.

3450. **Fire retardant treatment of timber.** *Timb. Technol.* 63 (2188), 1955 (71–3).

Describes the method and apparatus for determining the inflammability of timber, classification into 4 groups of inflammability, and different fire retardants now in use.

844. Attack by Plant Organisms

See also Nos. 2903, 2912, 3054.

844.1. Sap-staining and Mould Fungi

See No. 3006.

844.2. Wood-destroying Fungi

See also Nos. 2491, 2513, 2516–7, 3002–3, 3005–12, 3318, 3334, 3474.

3451. MEIER, H. **Decomposition of the cell wall by wood-destroying fungi and the submicroscopic structure of tracheids of Spruce and wood fibres of Birch.** *Transl. For. Prod. Lab., Can.* No. 92, 1956. pp. 30. 63 refs. Transl. from *Holz Roh- u. Werkstoff* 13 (9), 1955 (323–38). [See *F.A.* 18 No. 2221.] P.R.

3452. FINDLAY, W. P. K. **Durability of African mahogany—*Khaya ivorensis*.** *Emp. For. Rev.* 36 (1), 1957 (91–3). 2 refs.

In investigations at Princes Risborough, samples 10 × 2·5 × 1·25 cm. were cut from the central, intermediate and outer zones of the heartwood of one tree from Nigeria and one from Ghana. The samples were oven-dried at 100° C. for 18 hours, weighed and then exposed to infection, 4 samples each being placed on cultures of *Merulius lacrymans*, *Coniophora cerebella*, *Polystictus versicolor*, *P. sanguineus* and *Lenzites trabea*. After 4 months' incubation at 22° the samples were removed, again oven-dried and weighed. Results are tabulated, the extent of fungal decay being expressed as the % difference between the final dry weight and the initial dry weight. The outer zone of the heartwood showed considerably more decay resistance than the inner, the difference being particularly pronounced in the Nigerian tree. As durability is often correlated with amount and toxicity of water-soluble extractives, the amount of material soluble in boiling water was determined for the different zones. There were more extractives in the durable outer zone than in the heart, and the higher content was found in the outer wood of the Nigerian tree. As African Mahogany is commonly used in boat-building, it is suggested that the central core of the heartwood should be separated from the rest of the log during conversion as it lacks the necessary durability.

845. Attack by Animals

845.2. Terrestrial Borers

See also Nos. 2457, 2903, 2912, 3443.

3453. BECKER, G. Räuber und Parasiten holzzerstörender Insekten in Gebäuden. **[Predators and parasites of wood-destroying insects in buildings.]** *Verhandlungen der Deutschen Gesellschaft für Angewandte Entomologie E.V., Frankfurt a.M. 1952*, 1954 (76–86). 26 refs. [G.] I.I.E.

Discusses enemies of *Hylotrupes bajulus* and *Anobium* spp. In connexion with potential biological control, the relative importance and ease of breeding of one acarine, 2 clerid, 3 braconid, one chalcidid and one bethylid species are tabulated.

3454. BEESLEY, J. **Common borers in building timbers. Part III. The Anobiid borers.** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 226, 1957 (1–3).

Covers the life history of *Anobium punctatum*, diagnosis of attack, susceptible timbers, persistence of attack, treatment of timber and suitable insecticides, with a table of recommended dosages.

3455. BEESLEY, J. **Common borers in building timbers. Part IV. The pinhole borers—'ambrosia' beetles.** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 227, 1957 (1–3).

Recommends precautions and treatments with modern insecticides against scolytids, platypodids, and lymexylonids in Australian conditions.

3456. KENNEDY, D. E. **Worm holes in Jack Pine.** *Timber of Canada* 18 (1), 1957 (23–4, 26).

Joists from fire-killed *Pinus banksiana*, 2 × 8 in., can carry 8 or more holes of *Monochamus scutellatus* per foot run without loss of bending strength, and 2 × 4 in. studs, 4 or more holes/ft. without loss of compressive strength. Weakening by knots and sloping grain masks the wormhole effect.

3457. BAKER, J. M. **Investigations on the Oak pinhole borer, *Platypus cylindrus* Fab.: a progress report [with discussion].** *Rec.* [*6th*] *Conv. Brit. Wood Pres. Ass.* [1956] (92–111). 20 refs.

Discusses previous work on the biology of the insect, field observations and similar observations in timber yards on attraction to stumps and logs and the pattern of attack, and laboratory work on life history, feeding habits and associated fungi. [Cf. *F.A.* 18 No. 3136.]

3458. WEBB, W. E., and JONES, T. **The ambrosia beetle problem and log protection in West Africa [with discussion].** *Rec.* [*6th*] *Conv. Brit. Wood Pres. Ass.* [1956] (63–91). 2 refs.

Outlines research by the West African Timber Borer Research Unit on biological factors (condition of log, weather, susceptibility of wood species, including an index of relative susceptibility for 20 species, beetle specificity, and biology of the beetles) and on chemical control, and proposes a tentative programme of log protection for West Africa. Detailed results are to be published.

3459. **The kiln sterilization of *Lyctus*-infested timber [recommended practices].** *Leafl. For. Prod. Res., Lond.* No. 13 (rev.) 1957. pp. 4.

3460. SCHMIDT, H. *Sirex*-Holzwespe und Australien-Export. **[*Sirex* woodwasps and exports to Australia.]** *Holz-Zbl.* 83 (31), 1957 (399–400). 4 refs. [G.]

Briefly describes *Sirex gigas* and other species, the appearance of wood damaged by them, and methods of control by heat treatment or fumigation, including Australian quarantine requirements for obtaining the export certificates 'free of' or 'treated for, Sirex'.

3461. BLETCHLY, J. D., and FISHER, R. C. **Use of gamma radiation for the destruction of woodboring insects.** *Nature, Lond.* 179 (4561), 1957 (670).

Summarizes briefly the results, to be published in detail elsewhere, of experiments on the dosages needed, using cobalt-60 as source of gamma rays, to kill eggs, larvae and adults of *Lyctus brunneus*, *Anobium punctatum* and *Xestobium rufovillosum*.

3462. SANDERMANN, W., and CASTEN, R. Untersuchungen über die Verwertbarkeit radioaktiver Abfallstoffe von Atomkraftwerken als Holzschutzmittel. **[Investigations on the possible use of radioactive waste from nuclear power stations as wood preservatives.]** *Holz Roh- u. Werkstoff* 14 (1), 1956 (11–4). 8 refs. [G.g.] P.R.

Tests on termites with Sr^{90} showed that the effective use of this radio-isotope would entail serious health hazards.

845.3. Termites

See also Nos. 2448, 3073, 3429.

3463. HARRIS, W. V. **Termites destructive to timber [with discussion].** *Rec.* [*6th*] *Conv. Brit. Wood Pres. Ass.* [1956] (145–77). 8 refs.

Discusses families and genera involved, the nature, extent, distribution and control of damage, and methods of testing treated timbers.

3464. GÖSSWALD, K. **Laboratory testing of termite resistance with the yellow necked termite *Calotermes flavicollis* Fabr.** *Comp. Wood* 3 (4), 1956 (65–70). 22 refs. P.R.

On the basis of long personal experience, the author compares the suitability of *Reticulitermes lucifugus* (*a*) and *Calotermes flavicollis* (*b*) as the standard experimental insect in timber destruction tests. He decides in favour of (*b*), which can be bred very easily—although the fertility of its queens is inferior to that of (*a*), is always ready to attack, and has a considerable resistance to extremes of humidity (particularly drought) and to hunger; tests with (*b*), moreover, can be conducted with many fewer larvae than with (*a*). A standard test developed at the author's laboratory (Würzburg University) is described in detail.

3465. STEWART, D. **Sulfuryl fluoride—a new fumigant for control of the drywood termite *Kalotermes minor* Hagen.** *J. econ. Ent.* 50 (1), 1957 (7–11). 1 ref.

This new fumigant [manufactured by the Dow Chemical Co.] is compared with MeBr (extensively

used for control). Its advantages are non-inflammability, penetration, ease of application and lack of malodorous reactions. The commercial use of tarpaulins and sealing practice with forced gas circulation is satisfactory. Precautions are given. *From author's summary.*

846. Steaming

3466. Kubinsky, E. Vplyv parenia na pracovanie bukového dreva. **[Effect of steaming on the movement of Beech wood.]** *Drev. Výskum* 1 (1/2), 1956 (93–111). 5 refs. [Slovak.russ.g.] P.R.

Since tests in 1949–51 at the Timber Research Institute, Bratislava, failed to establish any effect of steaming on the dimensional stability of wood, another study was made in 1954, using more carefully selected test and control material. This was taken from vertically adjacent portions of growing trees so as to reduce the effect of different degrees of lignification, which varies much more in the transverse than the axial direction. Results showed that dimensional stability in Beech depends on the steaming time; while a short period of steaming slightly reduces the tendency to swell, longer periods lead to increased swelling. Shrinkage in drying is increased by steaming. When steamed Beech wood is air dried or conditioned, it has a lower equilibrium m.c. than unsteamed wood; further drying down to 0% m.c. gives a smaller final shrinkage than with unsteamed wood. These results agree with those obtained in the U.K. [*Leafl. For. Prod. Res. Lond.* No. 16—see *F.A.* 2, p. 310] and in France.

847. Drying (Seasoning)

See also Nos. 3181, 3406–8, 3432, 3474, 3478–9.

3467. Köppel, R. Zur Entwicklung der künstlichen Holztrocknung. **[The development of artificial seasoning of wood.]** *Holz-Zbl.* 83 (24), 1957 (301–4). Many refs. [G.]

Describes, with illustrations, drawing mainly on continental sources, accelerated air driers, small kilns, high-temperature, infra-red, centrifugal and high-frequency drying, and drying in liquids (with or without simultaneous impregnation), and discusses drying schedules, testing, control instruments etc.

3468. Tiemann, H. D. **The development of kiln-drying during the last 75 years.** *Sth. Lumberm.* 193 (2417—Christmas No.), 1956 (230–4).

Contains a short survey of U.S. and U.K. patents, back to the first English patent of 1720, illustrating the great diversity of methods tried with more or less success, and discusses the stimulus given to research and development in America by World War I, and recent developments and trends in the U.S.A.

3469. Knauss, A. C. **Seasoning degrade in kiln drying Ponderosa Pine in south central Oregon.** *Res. Note. Pacif. Nthwest. For. Range Exp. Sta.* No. 136, 1957. pp. 11. 1 ref.

Present the results of a study on the loss in volume and value of lumber from kiln drying and planing Ponderosa Pine timber, based on a supply of 322,000 bd. ft. of logs at a mill in Lakeview, Oregon. Data are tabulated.

3470. Kollmann, F., and Schneider, A. **A new laboratory dry-kiln constructed for investigations in a wide range of temperature, relative humidity and flow speed.** *Comp. Wood* 3 (5/6), 1956 (109–16). 2 refs. P.R.

Illustrated description of a new laboratory kiln in the Institut für Holzforschung und Holztechnik, Munich.

3471. Teesdale, L. V. **Dry kiln building materials and construction.** *Rep. U.S. For. Prod. Lab., Madison* No. 1646 (rev. ed.) 1956. pp. 10 + 3 dgms., 2 tbls. P.R.

Considerations on the service life of kilns and factors to be considered in building a dry kiln are followed by a description of building materials and structural details. The question of heat transfer is discussed. Tables give the coefficient of heat transmission for a number of structural combinations of kiln walls and roofs.

3472. Jírů, P. Vývin komorové sušárny na řezivo pro teploty pod 100° C. **[Development of a compartment kiln for drying converted timber at temperatures up to 100° C.]** *Drev. Výskum* 1 (1/2), 1956 (195–223). 11 refs. [Cz.cz.russ.g.] P.R.

Describes and illustrates the cross-shaft, overhead-internal-fan kiln ZIP2D12, made and widely used in Czechoslovakia, presents results of various tests with it (relating to performance, air flow and heat engineering) and suggests improvements in both design and material.

3473. Fessel, F. Die praktische Durchführung der Holztrocknung im hochfrequenten elektrischen Kondensatorfeld in verschiedenen Ländern. **[Practice of wood drying in the H.F. electric condenser field in different countries.]** *Holz Roh- u. Werkstoff* 14 (2), 1956 (41–7). 9 refs. [G.g.] P.R.

Reviews the results obtained in different countries [see *F.A.* 16 Nos. 1165–6, 3543]. The author believes that a progressive tunnel drier is better suited to large assortments, whereas a conveyor drier should be preferred for short pieces. The economic application of H.F. drying is still an open question.

848. Timberyard Practice. Handling and Storage of Timber

3474. Došek, O. Vplyv mokrej ochrany gul'atiny na kvalitu surových podvalov. **[Effect of wet storage of roundwood on the quality of untreated sleepers.]** *Drev. Výskum* 1 (1/2), 1956 (83–92). 8 refs. [Slovak.slovak.russ.g.] P.R.

When investigating the reason why unseasoned Beech sleepers made in summer from roundwood stored under water or continual spray develop much more incipient decay than those made in spring from green wood, it was found that: (1) sleepers made between June and August from wet-stored roundwood showed a high fungal degrade (53–66%) during air seasoning up to mid-September, decay being due to the very high initial moisture content (87–101%); no difference in this respect was found between wood stored under water and wood continually sprinkled; (2) controls made in the same

period from green wood showed less degrade (47–50%) owing to a smaller initial m.c. (69–75%); (3) controls made in May from green wood showed only 13% fungal degrade. It is concluded that in order to reduce the amount of degrade due to incipient decay, the m.c. should be lowered to < 55% within 10 days of the sleepers' being made.

85. Grading of Wood and Wood Products

851. Timber Quality in General

See Nos. 3236, 3485.

852. Detection, Recognition and Assessment of Injuries and Defects

See also Nos. 2852, 3054, 3179, 3291–5, 3300, 3344, 3385, 3404, 3407–8, 3411–12, 3469.

3475. PECK, E. C. **Can sweep in saw logs be straightened?** *Lumberm.* 84 (2), 1957 (96).

Four 12-ft. *Quercus rubra* logs with sweeps 2–7 in. out of plumb were heated for 48 hours in water at 160° F. or 30 min. electrically (total 9KWH) to 165°, then loaded on a timber-testing machine until sweeps were over-corrected by 1–1·5 in. When sawn to 1-in. boards with faces at right angles to the plane of original sweep, kiln-dried to 7·2% m.c. and allowed to reabsorb moisture up to a m.c. of 10·3%, bowing was negligible. One log with 7½ in. sweep, however, broke under load.

3476. MAYER-WEGELIN, H. Die biologische, technologische und forstliche Bedeutung des Drehwuchses der Waldbäume. **[The significance of spiral grain in trees from the biological, technological and forestry aspects.]** *Forstarchiv* 27 (12), 1956 (265–71). 41 refs. [G.]

The biological characters of spiral grain are discussed with reference to the literature, and its influence on wood properties is examined. Logs with spiral grain are best left as round timber and used as supporting beams, since sawing cuts obliquely across the fibres and significantly lowers the strength of the logs. When the moisture content changes, the log warps along the grain; a distortion of 50° has been noted at the end of a power transmission pole. Cracks in the wood, e.g. from frost, run along the grain, and therefore across the bole; in the case of Oak this completely destroys its value for veneer. Trees with spiral grain show a greater flexibility than trees with straight fibres and will bend under heavy loads of snow. Silvicultural measures to eliminate trees with spiral grain are suggested.

3477. DAVIS, E. M. **Grain separation and related effects in Douglas Fir door stock.** *Wood-Worker, Indianap.* 74 (11), 1956 (12–3, 26 . . 30). P.R.

Presents a summary of results of tests on the nature and causes of surface defects that appear when Douglas Fir (and other timbers) are being worked, particularly against the grain.

3478. MCMILLEN, J. M. **Coatings for the prevention of end checks in logs and lumber.** *Rep. U.S. For. Prod. Lab., Madison* No. 1435 (rev. ed.) 1956. pp. 13 + 6 photos. + 1 dgm. + 2 gphs. 6 refs. P.R.

Discusses the general properties of efficient end-coatings, and describes in some detail the principal types of hot and cold end-coatings, their merits and methods of application.

3479. CLARK, J. W. **A gray non-fungus seasoning discoloration of certain Red Oaks.** *Sth. Lumberm.* 193 (2417), 1957 (35–8). 3 refs.

Reports on tests with *Quercus velutina*, *Q. falcata* and *Q. borealis* to prevent this stain from developing during air drying. Preheating with steam at ⩽ 120° F. for an hour or more (less for higher temperatures) and air-drying at ⩾ 50° F. prevented staining, but only preheating to > 200° F. prevented its occurrence on re-wetting and re-drying. It generally started in the older sapwood and is thought to be due to an oxidizing enzyme, non-active below a certain temperature, and destructible by heat. A grey discoloration in the walls of the wood fibres is associated with concentrations of amber to brown globular deposits, chiefly in the rays. Fungicides, though ineffective against this stain, may have to be used with preheating treatments to counteract the greater susceptibility of pre-heated wood to fungal attack.

853. Grading of Wood in the Rough

3480. WALTERS, C. S., and HERRICK, A. M. **A comparison of two log-grading systems.** *Bull. Ill. agric. Exp. Sta.* No. 603, 1956. pp. 23. 11 refs.

A comparison was made, on 308 logs at 4 sawmills, of (1) the Madison system of log grading [cf. *F.A.* 11 No. 1157] and (2) the quality index developed at Purdue University [cf. *F.A.* 18 No. 813]. The two systems generally agreed in the grading of the best and the worst logs, but (1) was more accurate than (2) for medium grades; it is, however, more time-consuming and needs greater skill and knowledge in the grader.

3481. WALLACE, O. P. **A simple method for grading hardwood logs.** *Sta. tech. Bull. N.H. agric. Exp. Sta.* No. 94, 1955. pp. 7. 7 refs.

Tests of 988 logs confirmed the usefulness of a simple system of grading New Hampshire hardwood logs by number of clear faces (0–4) and top d.u.b. (10–14 in., and ⩾ 15) into 4 grades.

3482. WHITMORE, R. A., JR., and JACKSON, W. L. **An improved method for estimating quality in standing trees.** *J. For.* 55 (2), 1957 (142–3). 4 refs.

A comparison of 3 methods of grading logs was made on 203 trees of *Quercus velutina* felled in commercial logging operations in S. Illinois, viz. by 16-ft. logs, by the best 12 ft. of all 16-ft. logs except the top log, and by cutting in various lengths for the maximum log grade. The mean tree-quality indices obtained by the last two methods were nearly identical, and were significantly higher than that obtained by grading the full 16 ft. Log-quality recovery can best be estimated in the standing tree by basing the grade of each 16-ft. log tallied on the best 12–14 ft., except for the top logs which should be graded by length. The principle tested should also apply to other species in other hardwood areas.

854. Grading of Converted Timber

See also No. 3392.

3483. **Structural grading of softwoods.** Timber Development Association, London. [1956?]. pp. 23.

Consists of extracts from British Standard Code of Practice No. *C.P.* 112, 1952 *The Structural use of timber in buildings.* and *Brit. Stand.* No. 1860, 1952, *Structural Softwood—measurements of characteristics affecting strength*, which are presented for easy reference in the timber yard and at the building site, under the headings: basic stresses, natural characteristics, grading procedure, and method of measurement (of rate of growth, shakes etc., slope of grain, knots and wane).

859. Grading: Miscellaneous

3484. HYLER, J. E. **Aspects of wood printing.** *Wood-Worker, Indianap.* 73 (12), 1955 (10–1, 18 . . . 23). P.R.

Describes several types of wood-printing machines.

86. Pulp Industries. Composite Materials made Wholly or Partly of Woody Matter. Chemical Utilization of Wood

861. Pulp and Paper Manufacture. Textile and Other Cellulose Derivatives

See also Nos. 2681, 2836, 3181–3, 3248, 3253, 3256, 3261, 3286, 3288.

3485. WELLWOOD, R. W. **Pulp quality and the forester.** *Pulp Paper Mag. Can.* 58 (2), 1957 (89–91). 9 refs.

A paper presented to the Canadian Pulp & Paper Association in November 1956 on the variation in ring width, cell-wall thickness, cell length and orientation, sapwood and heartwood, knots, age and tree size in material delivered to British Columbia pulp mills, and on methods for the control of quality and the production of better pulpwood trees.

3486. BÜRKI, M. L'utilisation de peuplier dans l'industrie suisse du papier. **[The use of Poplar in the Swiss paper industry.]** *Schweiz. Z. Forstw.* 108 (1), 1957 (50–2). [F.]

The present demand is estimated at 37,000 cu.m., of which ca. 2000 are supplied by Switzerland. Owing to the technical superiority of conifer pulps, demand will always be limited in Switzerland despite the greater cheapness of hardwoods for pulping, as Swiss industry is geared to quality, but a market exists for sound straight wood, $<$ 10 cm. end diameter, of *Populus nigra*, *P. alba*, *P.* '*canadensis*', and especially *P. tremula*.

3487. YONEZAWA, Y., MIYAZAKI, K., and USAMI, K. **[Studies on high yield pulp (Part 1). Attempt to prepare paper-making pulp from Asplund pulp.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 90, 1956 (1–22). 8 refs. [Jap.e.*e.*]

Asplund pulp of Red Pine [*P. densiflora*?] refined with Cl-NaOH (6 stages) and bleaching powder (one), was not stronger than its kraft pulp. Attempts to improve it by pretreatment with Na_2SO_3, and $CaCO_3 + Na_2SO_3$, by the kraft process, and by refining with HNO_3, were all unsuccessful. Tables give the strength properties of the papers prepared.

3488. YONEZAWA, Y., and USAMI, K. **[Studies on high yield pulp (Part 2). On the derivatives of Asplund pulp.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 90, 1956 (23–36). 11 refs. [Jap.jap.e.*e.*]

Glycolification, carboxymethylation and esterification of Asplund pulp of Western Hemlock [*Tsuga heterophylla*] were tried in various degrees by adjusting the mixtures with cotton pulps, with a view to improving the strength without decreasing the yield. Comparative tables of paper strengths are given. [Cf. preceding abstract.]

3489. ISTAS, J. R. Amélioration des qualités papetières des pâtes écrues des essences feuillues congolaises: influence du parenchyme. **[Improvement of unbleached pulps from [Belgian] Congo hardwoods: effect of the parenchyma.]** *Bull. agric. Congo belge* 47 (6), 1956 (1537–49). [F.flem.]

The effect of eliminating the parenchyma is here investigated in *Entandrophragma candollei* (32–40), *Irvingia gabonensis* (40), *Panda oleosa* (20), *Fagara macrophylla* (15), *Celtis mildbraedii* (15) and *Drypetes* sp. (15) [the figures indicate the % volume of parenchyma in the timbers]. Tables show the dimensions of the fibres present before and after the removal of parenchyma by sedimentation and sieving; the cooking conditions (kraft); and the properties of the pulps prepared with and without the parenchyma fraction. It is concluded that the removal of the parenchyma can involve considerable losses of fibres but usually increases the tearing, splitting and bursting strengths of papers digested to 35° SR but not always to an extent that would justify the removal of parenchyma on an industrial scale. It has a very adverse effect on digestion (e.g. in increasing the time required), and is not justified for poor paper-making species with high parenchyma contents.

3490. CHRISTIANSEN, C. B., HART, J. S., and ROSS, J. H. **Sulphidity as a variable in the pulping of Western Red Cedar [*Thuja plicata*]: the effect of the Na_2S wood ratio on pulp properties.** *Pulp Paper Mag. Can.* 58 (1), 1957 (103–9). 10 refs.

Demonstrates, for this species of proved suitability for alkaline pulping, the beneficial influence of sulphide on the cooking reaction and on the reduction of bleachable pulps of exceptionally high strength properties in reasonable yield. The rate of pulping is dependent on both the alkalinity of the liquor and the sulphide charge. The deleterious action of liquors of high alkalinity can be offset by the use of sulphide. No upper limit to the improvement of yield and strength by adding sulphide was found, but between 3 and 5% is a value beyond which improvement was small and difficult to measure.

3491. PEARL, I. A. **Manufacture of pure organic chemicals from chemical pulping wastes.** *For. Prod. J.* 6 (12), 1956 (505–7). 13 refs.

Discusses the production from alkali-process waste liquors and gases, of lignin, saccharinic acid derivatives, tall oil, and sulphate turpentine, and

research into the utilization on a competitive basis of the sugars and lignins of sulphite liquors, dealing with the possibilities of vanillin and conidendrin derivatives and Spruce turpentine.

862. Composite Materials made Wholly or Partly of Woody Matter

See also Nos. 2681, 3259.

3492. STEGMANN, G. Genfer Plattenkonferenz I–III. **[The Geneva fibreboard and hardboard conference.]** *Holz-Zbl.* 83 (30; 34; 35), 1957 (379–80; 459–62; 469–71). [G.]

A report on the conference (Feb. 1957) under the following headings: General matters, descriptions and definitions, raw materials; techniques and equipment, properties and uses; production, consumption and trade, prospects of supply and demand, research tasks. A list of the principal papers, with authors, is given.

3493. RISHELL, C. A. **Fundamental economics of the particle board industry.** *For. Prod. J.* 7 (1), 1957 (6–9).

Discusses uses, raw materials, and the structure of the industry, comparing U.S. and European developments and describing the rapid growth of the industry in Germany. Trends in markets products and processes are discussed.

3494. KLAUDITZ, W. Entwicklung und Stand der Holzspanplattenherstellung. **[Development and present position of particle-board manufacture.]** *Holz-Zbl.* 83 (9), 1957 (87–91). 13 refs. [G.g.e.*e.*]

Discusses processes used in Germany, types of boards manufactured, and their properties, and gives production statistics, chiefly for 1956. [Cf. *F.A.* 18 No. 2273.]

3495. KLAUDITZ, W., and GRÜNEWALD, W. Zur Rohholzversorgung der Spanplattenindustrie. **[The raw-materials position of the particle-board industry.]** *Holz-Zbl.* 83 (9), 1957 (84). 3 refs. [G.g.e.]

Contains data on the growth of German output and the raw materials used in 1956, 26% of which were industrial residues, and an increasing % hardwoods, mainly Beech. Future supplies seem assured.

3496. MIDYETTE, A. L. **Wood particle molding.** *For. Prod. J.* 7 (1), 1957 (1–6).

A review of the process, discussing its applicability, technical and economic, to various articles, largely as an alternative to solid wood or plastics. Strength and related properties, as affected by modifications in production or composition, equipment needed, finishing, and the growth of the industry in the U.S.A. are discussed.

3497. **New plant converts slabs to waferboard.** *Wood, Chicago* 61 (5), 1956 (26–9, 76–7). P.R.

Illustrated description of the following operations in making this type of chipboard from slabs: hydraulic barking, steaming, cutting (waferizing), mixing with synthetic resin and petrolatum wax, and pressing in a steam-heated press. The merits of the (Tenex) board are discussed.

3498. FAHRNI, F. Das Verpressen von Spanplatten bei gefeuchteten oder feuchteren Deckspänen. **[Chipboard pressing with the outer chip-layers more or less moist.]** *Holz Roh- u. Werkstoff* 14 (1), 1956 (8–10). [G.g.] P.R.

Discusses the advisability of maintaining a higher moisture content in the outermost layers, and the effect of this procedure on the economic and technical side of the process.

3499. Das Holzhaus ist nicht tot! Eine neue feuersichere Holzbauweise. **[Wooden houses are not out. A new type of fire-resistant construction.]** *Holz-Kurier, Wien* 12 (6), 1957 (1–2). [G.]

Describes a prefabricated house of Austrian manufacture, suitable for small-scale production, in which the walls are built up from 'Elasticell' board units—a composite building material made from sawdust and wood waste with magnesite and other minerals and chemicals. Erection on the site is stated to be quick, weight low, thermal properties, fire resistance, durability etc. good.

3500. GOLBS, H. Die Verarbeitung der Holzspanplatte im Möbelbau. **[The processing of chipboards in furniture manufacture.]** *Holz Roh- u. Werkstoff* 14 (2), 1956 (68–74). 5 refs. [G.g.] P.R.

Detailed illustrated description of chipboard grades, their dimensional stability, edge-gluing, veneering, sawing, planing, moulding, boring and joining.

3501. NORTHCOTT, P. L. **The glueline-cleavage test applied to hardboard gluability.** *Comp. Wood* 3 (5/6), 1956 (125–34). 11 refs. P.R.

Presents the results of a study made in order to evaluate the glueline-cleavage test [cf. *F.A.* 14 No. 2731]. The variables involved were: 7 different glues, hardboards of high and low resin content obtained by each of the main processes (wet flow, wet batch, and semi-dry), and front and back surfaces. It was demonstrated that, from the standpoint of efficiency, reproducibility, and accuracy, the glueline-cleavage test is superior to the tension-normal test. [Cf. *F.A.* 15 No. 3065.]

863. Wood Hydrolysis. Saccharification

3502. ŠARKOV, V. I., KOROLJKOV, I. I., and GARMANOVA, E. N. O povyšenii vyhoda sahara pri gidrolize drevesiny putem ee predvariteljnogo razmola. **[Increasing the sugar yield in wood hydrolysis by preliminary grinding of the wood.]** *Gidrol. lesohim. Prom.* 9 (1), 1956 (6–8). 4 refs. [Russ.] P.R.

Recent Soviet researches (Šarkov, Norina and Dobuš, *Sbornik Trudov VNIIGS* 3, 1950, p. 22; Dobuš, The mechanism of cellulose hydrolysis, *Degree thesis, Leningradskaja lesotehničeskaja Akademija*, 1952; Zarkovskiĭ and Lipatov, *Izvestija Akademii Nauk BSSR* 1952, No. 2 (169) and 1953, No. 5 (115)) have shown that cold grinding of cellulose only slightly increases the sugar yield when the cellulose is hydrolysed by hot dilute H_2SO_4,

because the amorphous cellulose obtained by grinding is recrystallized by contact with water. The authors developed a special oscillating steel-ball mill, capable of being heated, in order to investigate the effect of the grinding and heating of the ground material on the sugar yield. Control tests with cotton cellulose showed that the sugar yield from untreated cellulose was 5·7%, from cellulose ground for 60 min., but not heated, 23·0%, and from cellulose ground in CO_2 for 60 min./at 210° C., 60·6%. When Scots Pine sawdust containing 17·8% easily hydrolysable and 44·5% not easily hydrolysable polysaccharides was tested, grinding for 60 min. increased the sugar yield by 65% (with 10% H_2SO_4) or by 42% (with 1% H_2SO_4). Since tests with cotton cellulose showed that grinding at ordinary temperature with subsequent heating gave almost the same results as grinding at high temperature, final tests were carried out with a lignocellulosic preparation made from Scots Pine wood. Saccharification was effected by 10% H_2SO_4 at 100°. The sugar yield was: (1) original material, ca. 5% in terms of polysaccharides present; (2) after cold grinding for 20 min., 29%; (3) after heating the cold-ground material for 10 min. in CO_2 at 230°, 62%. A similar investigation carried out at 180° with 1% H_2SO_4 gave the following respective yields: 25·0, 46·0 and 48·0% (in terms of total weight, the polysaccharide content being 57·7%). The maximum yield was reached after (1) 40 min. for untreated wood, (2) 21 min. for cold-ground wood, and (3) 13 min. for cold-ground and heated wood.

866. Utilization of Wood Extractives

See also Nos. 3331–2, 3524.

3503. MEDNIKOV, F. A. O svoĭstvah i primenenii kanifoli iz svežego osmola. **[Properties and use of rosin obtained from fresh [Scots Pine] stumps.]** *Gidrol. lesohim. Prom.* 9 (8), 1956 (18–9). 10 refs. [Russ.] P.R.

Tabulates results of technical analyses of rosin obtained from both fresh and old stumps (sapwood and heartwood analysed separately). Rosin from fresh sapwood contains the lowest % of resin acids and the highest % of fatty acids. It can be used for the same purposes as rosin obtained by tapping or from old stumps.

3504. SAIKIA, M. L. **A note on the formation of Agarwood in the Sasi tree (*Aquilaria agallocha*).** *Proc. 8th silv. Conf., Dehra Dun 1951* Part 2, 1956 (42–4).

Describes experiments in artificial inoculation of trees to promote the formation of the diseased resinous heartwood from which a valuable essential oil is obtained. [Cf. *F.A.* 14 No. 2882.]

867. Destructive Distillation

See also Nos. 3257, 3524.

3505. PETER, R. **An inexpensive method for measuring charcoal kiln temperatures.** *Sta. Pap. Stheast. For. Exp. Sta.* No. 73, 1956. pp. 9.

Describes the adaptation of a standard D.C. microammeter, together with thermo-couple (iron/constantan) wiring, to furnish satisfactory readings of the temperature differences between points inside the kiln and outside.

3506. BURAKOV, I. F., LIVEROVSKIĬ, A. A., and POMERANCEV, V. V. Énergohimičeskoe ispoljzovanie drevesnyh othodov. **[Combined utilization of wood waste as fuel and source of chemical products.]** *Gidrol. lesohim. Prom.* 9 (1), 1956 (8–10). 3 refs. [Russ.russ.] P.R.

Illustrated description of the construction, operation and merits of a newly developed installation in which wood chips fall continuously from a hopper and are dried by boiler flue gases; they then pass through a distributor into the destructive-distillation chamber, the volatile products being led into the condensing and separating plant, while the 'coke' residue is burnt underneath. The flue gases from the coke are mainly diverted to the boiler, only a relatively small % being used for drying the chips. The performance of the plant is shown in tables.

3507. KORJAKIN, V. I., REPIN, A. S., and HLYZOV, A. N. Osvoenie vertikaljnoĭ nepreryvno deĭstvujuščeĭ retorty na Amzinskom lesohimičeskom zavode. **[Utilization of the vertical, continuous-operation retort in the Amza wood-chemical plant.]** *Gidrol. lesohim. Prom.* 9 (4), 1956 (4–7). 3 refs. [Russ.russ.] P.R.

Describes and illustrates the construction and operation of a retort embodying some improvements on that previously described [*F.A.* 17 No. 2242]. The yield of commercial acetic acid obtained was 16 kg./cu.m. of wood.

3508. LJAMIN, V. A., AVAKJAN, N. D., and VYRODOV, V. A. Gazifikacija lesosečnyh othodov. **[Gasification of logging waste.]** *Gidrol. lesohim. Prom.* 9 (3), 1956 (8–10). 7 refs. [Russ.russ.] P.R.

Tests showed that the destructive distillation (in a retort or a gas-generator) of Spruce logging waste gives less volatile acids and soluble tar than the distillation of stemwood. The properties of the sedimentation tar obtained from destructive distillation of coniferous logging waste do not deteriorate with storage.

3509. FEFILOV, V. V., KLINSKIH, E. V., and FILONENKO, JA. R. Termičeskaja pererabotka drevesnoĭ kory. **[Heat processing of bark.]** *Gidrol. lesohim. Prom.* 9 (8), 1956 (15–6). [Russ.russ.] P.R.

Spruce bark is not suitable for destructive distillation but can be used in gas-producers, with the addition of a certain proportion of wood waste.

89. Other ('Minor') Forest Products

892. Vegetable Products

3510. BADHWAR, R. L. **The need for obtaining data about the quantity and value of minor forest products.** *Proc. 8th silv. Conf., Dehra Dun 1951*, Part 2, 1956 (419–25).

A plea for putting the production and marketing of India's varied and valuable minor forest produce on an organized basis. The prevalence of lump-sum sales covering whole ranges or divisions and an unspecified variety of products has left forest departments and other forest owners in almost complete ignorance of the kinds and quantities of

produce exported. To end this state of affairs 'proformas' considered suitable for recording data are put forward, together with a classified list of some 130 important raw materials, including 31 sources of drugs, and another list of important finished products, for which figures will be made available by government departments.

892.1. Grass. Litter. Leaf Fodder etc.

3511. BOGDANOVIČ, N. Hvoja—vitaminnyĭ korm dlja skota. [**Conifer needles as vitamin-containing fodder for cattle.**] *Lesn. Prom.* [*News Edition*] 1957 (7), (4). [Russ.] P.R.

For the last 5 years cattle, horses and pigs on the farm of a Soviet lespromkhoz have been fed Spruce, Scots Pine, Silver Fir and Juniper needles at the following daily rates: adult cattle 4–6 kg. per head, young cattle 0·5–3 kg. per head, pigs 2 g./kg. of weight. One- to 3-year-old shoots are put through a straw-cutter and the choppings, 1·5–2 cm. long, placed in vats and covered with boiling water. The vats are then tightly covered and left for 10–12 hours, at a room temperature of 10–12° C. The material is then usually mixed with bran and fed once daily at noon, before watering. It is claimed that the application of this fodder has resulted in an increase of milk production by 18–20%, and an increase in weight increment by 15%.

892.4. Bark Products. Tanstuffs. Cork

See also Nos. 2876, 2908, 3509.

3512. CIUTA, G. Produse naturale cu conţinut de substanţe tanante. [**Native [Rumanian] species containing tannins.**] *Rev. Pădurilor* 71 (5), 1956 (319–25). 7 refs. [Rum.russ.g.]

Lists 32 species (mainly trees and shrubs) and gives data from the literature and from recent analyses for tannin content % of bark of Oak, Willows, and Spruce, leaves of Sumac [*Rhus cotinus*], Oak galls, and Oak wood.

3513. SÜSZER, A., ALEXANDRESCU, G., and GANEA, G. **Tanning extract from Spruce cones.** *Rev. chim. Bucharest* 6, 1955 (465–6). [Rum.?] From *abstr.* in *Chem. Abstr.* 50 (21), 1956 (16147). P.R.

A 50-g. cone contained ca. 5 g. tannin. Preparation of an extract is described, whose final composition was: water 62–64, tannins 24–25, non-tannins 11–12, insolubles 0·5–0·7%. The extract gave good results in a pilot operation.

3514. PUTNAM, R. C. **The chemistry of vegetable tannins. XIV. Wattle.** *Journal of the American Leather Chemists' Association, Easton, Pa.* 51 (4), 1956 (169–74). P.O.

3515. CLEMENTE, S., and FALCHI, M. Il sughero nel bacino del Mediterraneo. [**Cork in the Mediterranean region.**] Assessorato Agricultura e Foreste, Regione Autonoma della Sardegna, Cagliari. [1954.] pp. 206 + 40 photos. 26 refs. [It.]

In four parts: (1) establishment and care of *Quercus suber* stands; (2) distribution of the principal centres of cork production and cork factories in Spain, Portugal, and Sardinia; (3) government regulations, legislation etc., affecting the cork industry; (4) future prospects of the Sardinian industry.

3516. LAMOUSSIÈRE, R. Essais comparatifs de dégustation de vins de Champagne bouchés liège et plastique. [**Tasting trials of Champagne wines with cork and plastic stoppers.**] *Chêne-Liège* No. 1545, 1957 (15 . . . 19). [F.]

Detailed results are given of trials carried out at a research station in Champagne, which established the superiority of the traditional cork stopper. The plastic stopper appears to cause a considerable reduction in SO_2 and a change in colour, and these and other forms of deterioration increase with time.

3517. MANI, R., RAMANATHAN, V., and VENKATARAMAN, K. **The colouring matters of Ponderosa Pine bark. Part II. A synthesis of pinoquercetin and pinomyricetin.** *J. sci. industr. Res., India* 15*B* (9), 1956 (490–5). 11 refs. D.S.I.R.

For part I, *see F.A.* 16 No. 4790, 17 No. 2257.

3518. ROUX, D. G. ***d*-Gallocatechin from the bark of *Casuarina equisetifolia* Linn.** *Nature, Lond.* 179 (4551), 1957 (158–9). 6 refs.

3519. ERDTMAN, H. ***Fagara xanthoxyloides*.** *Colon. Res., Lond. 1955/56*, 1956 (235).

Extraction of bark with light petroleum yielded an oil from which were obtained two compounds, identified as lupeol and *d*-sesamin. The properties of these substances were compared with those of fagarol isolated by other workers from the same species. It was concluded that *F. xanthoxyloides* is able to synthesize *d*- and *l*-sesamin, the amounts varying from specimen to specimen. Alternatively there may be various strains of *F. xanthoxyloides* or hybrids between closely related species.

892.5. Medicinal Plants, Edible Plants, Insecticides from Plants etc.

3520. BHATTACHARJI, S., DHAR, M. M., and DHAR, M. L. **Raunescine, a subsidiary alkaloid from *Rauwolfia canescens* Linn.** *J. sci. industr. Res., India* 15*B* (9), 1956 (506–9). 13 refs. D.S.I.R.

A new alkaloid, provisionally named raunescine, has been isolated from the roots of *R. canescens*. Its formula is $C_{22}H_{28}N_2O_3$; structural formulae are suggested.

3521. FEDOTOVA, T. K., and TE, V. [**Unabi (Chinese Date) [*Zizyphus jujuba*], a rich source of vitamin C.**] *Voprosy Pitanija, USSR* 14 (6), 1955 (43). [Russ.] From *abstr.* in *Chem. Zbl.* 127 (30), 1956 (8394). [G.] D.S.I.R.

The vitamin content of the fruit is nearly the same as that of Rose hips and green walnuts; unlike the latter, the *Zizyphus* fruit increases its vitamin content on ripening.

892.6. Resin and Turpentine. Essential Oils. Fixed Oils and Fats. Gums. Latex. Dyestuffs. Sap Sugar

See also Nos. 2528–9, 2534, 2576, 2878–89.

3522. SNESAREV, K. A., VOROBJEVA, M. T., and ZARAKOVSKAJA, A. I. Bystryĭ metod opredelenija

vlažnosti živicy. **[A rapid method of determining the moisture content of crude resin.]** *Gidrol. lesohim. Prom.* 9 (4), 1956 (19). 2 refs. [Russ.] P.R.

Illustrated description of the design, operation and merits of the Soviet-made dielectric moisture meter VÈB.

3523. SNESAREV, K. A., VOROBJEVA, M. T., and AGEEV, M. E. Bystryĭ cehovyĭ metod opredelenija temperatury razmjagčenija kanifoli. **[A rapid factory-shop method of determining the softening-point of rosin.]** *Gidrol. lesohim. Prom.* 9 (4), 1956 (17–8). 2 refs. [Russ.] P.R.

Illustrated description of an apparatus that records the time taken for a rosin specimen to soften to a certain degree of viscosity, when heated in standard conditions. The softening-point temperature is then read off a graph.

3524. KOWATSCHEW [KOVAČEV], V. V. **[Technology of rosin and turpentine.]** *Težka Promišlennost, Sofia* 4 (10), 1955 (37–45). [Bulg.] From *abstr.* in *Chem. Zbl.* 127 (25), 1956 (7091). [G.] D.S.I.R.

Describes methods used in Bulgaria to extract turpentine and rosin: (1) distillation of Spruce-needle oil (62–72% α-pinene, 5–6·4% β-pinene, 9–21·8% Δ^3-carene, 5·4–12% camphene) and distillation of Larch resin (the dark exudate on trees not artificially wounded); (2) extraction of Spruce wood with benzine (this also yields flotation oil containing 44–46% of surface-active terpene alcohols $C_{10}H_{17}OH$), and (3) destructive distillation of Spruce wood, resulting in turpentine, retort charcoal and Spruce tar.

3525. BARDYŠEV, I. I., and ČERČES, H. A. Abietinovaja kislota—pervičnaja kislota živicy eli obyknovennoĭ (*Picea excelsa* Link). **[Abietic acid—a primary acid of *Picea abies* resin.]** *Ž. prikl. Him.* 29 (12), 1956 (1888–9). 14 refs. [Russ.russ.] P.O.

Abietic acid, whose presence was detected by absorption spectroscopy, was isolated by the authors from the resin of *P. abies*.

3526. MEDNIKOV, F. A., and GOLJDMAN, K. G. O svoĭstvah elovoĭ živicy i produktov ee pererabotki. **[Properties of Spruce resin and of the products of its processing.]** *Gidrol. lesohim. Prom.* 9 (7), 1956 (12–3). 15 refs. [Russ.] P.R.

Presents in tables the results of the chemical and physico-chemical analysis of Spruce resin obtained by Tolkačev's method [see *F.A.* 16 No. 3032]. It is, properly speaking, a substance resembling a mixture of turpentine and scrape, and not the crude resin of Pines. Some properties of Spruce turpentine and rosin are also indicated.

3527. UPADHYAY, M. D. **Progress of [*Pinus longifolia*] resin industry in Uttar Pradesh.** *Indian For.* 83 (1), 1957 (26–33).

Includes figures of production from 1903.

3528. HANDA, K. L., and VASUDEV, I. C. **Examination of the fixed oil of *Adhatoda vasica* seeds.** *J. sci. industr. Res., India* 15*B* (10), 1956 (612–3). 5 refs. D.S.I.R.

Gives the physical and chemical properties of the oil and describes the liquid and solid acids contained in it.

3529. MACKIE, A. **[Leaf wax from *Annona senegalensis*.]** *Colon. Res., Lond. 1955/56*, 1956 (235).

Palmitone has been isolated from both the hard and soft waxes. From the unsaponifiable fraction of the soft wax, two sesquiterpene oils have been obtained that are promising sclerostome larvicides.

892.7. Fruits. Seeds. Fibres, Yarns and Flosses

See also No. 2430.

3530. CLARKE, E. G. C., and COTCHIN, E. **A note on the toxicity of the acorn.** *British Veterinary Journal, London* 112 (4), 1956 (135–9). 5 refs. W.A.H.

The causes of occasional poisoning by acorns of cattle, particularly up to 2 years old, but also of other animals, including pigs, are little understood. Cases of poisoning occur in some years but not in others. In experiments with acorn extracts (chiefly *Quercus robur* from Bedfordshire and Hampshire) by intraperitoneal injection into mice, the only substance exhibiting a significant toxicity was a hydrolysable tannin.

893. Animal Products

3531. SINGH, G. D. **Departmental collection of honey and wax, Bhinga Range, Baharaich Forest Division, Uttar Pradesh.** *Indian For.* 83 (2), 1957 (113–7 + 3 photos).

9. FORESTS AND FORESTRY FROM THE NATIONAL POINT OF VIEW. SOCIAL ECONOMICS OF FORESTRY

90. General

3532. HERZOG, W. Die Forstwirtschaft Brasiliens, gestern, heute, und morgen. **[Forestry in Brazil, yesterday, today and tomorrow.]** *Forst- u. Holzw.* 12 (2), 1957 (19–21). [G.]

The author, forestry adviser to the Brazilian Department of Agriculture, describes the ruinous exploitation of forests near centres of population, the resultant widespread deforestation, erosion and floods, the transport problem and afforestation policy (particularly for Eucalypts). He stresses the need for a trained, adequately paid forest service, training facilities, and research.

3533. COCHIN, P. Informe al gobierno de Bolivia sobre algunos problemas forestales. **[Report to the government of Bolivia on some forest problems.]** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 512, 1956. pp. 19. [Span.]

The report, based on a 6-months' mission to Bolivia, presents information on the rôle played in

Bolivia's economy by forest products, including rubber, Brazil nuts and cacao. Although timber is one of the country's chief natural resources, it plays only a small part in the national economy. The forest regions are reviewed and recommendations made for the reorganization and expansion of the forest service, the conservation of vegetation and soils, afforestation trials of native and exotic species, and methods of exploitation.

902. History of Forests and Forestry

See also No. 2624.

3534. GRAYSON, A. J., and JONES, E. W. **Notes on the history of Wytham Estate with special reference to the woodlands.** Imperial Forestry Institute, Oxford. 1956. pp. 28 + 2 maps in pocket. 24 refs. Price 5*s*.

3535. GEORLETTE, R. Quelques aspects de l'histoire des forêts françaises depuis la fin du moyen âge jusqu' à la promulgation de l'Ordonnance de 1669. [**Some aspects of the history of French forests from the end of the Middle Ages to the promulgation of the Ordinance of 1669.**] *Rev. for. franç.* 9 (2), 1957 (113–27). 52 refs. [F.]

3536. HÄFFNER, A. J. Die Bewaldung des Riesgebietes um das Jahr 1650. [**The forests of the Ries basin about the year 1650.**] *Forstwiss. Cbl.* 75 (5/6), 1956 (181–92). 11 refs. [G.]

3537. MINCKWITZ, H. VON. Zur Waldgeschichte des Staatlichen Forstwirtschaftsbetriebes Sonneberg vom ausgehenden Mittelalter bis zur Mitte des 19. Jahrhunderts. [**The history of the Sonneberg State forest management unit from the end of the Middle Ages to the middle of the 19th century.**] *Arch. Forstw.* 5 (7/8), 1956 (457–86 + 1 map). 42 refs. [G.g.]

3538. JANČÍK, A. Porostní vývoj lesů panství hukvaldského. I. (Do poloviny 19. století.) [**Evolution of stands in the forests of the Hukvaldy estate [Bohemia]: I. (Up to the mid-19th century).**] *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 29 (3), 1956 (193–232 + 1 map). 37 refs. [Cz.russ.e.g.]

Traces the composition, extent and utilization of these forests from the 15th century on.

3539. STRACEY, P. D. **The development of forestry in Assam in the last 50 years.** *Indian For.* 82 (12), 1956 (619–23 + 5 photos).

3540. CHOUDHURY, K. C. R. **Progress of forestry in Bengal.** *Indian For.* 82 (12), 1956 (624–7).

3541. [**The development of forestry and forest industries in the South.**] *Sth. Lumberm.* 193 (2417—Christmas No.), 1956 (110 . . . 184).

This 75th anniversary number contains a series of articles, chiefly historical, on Southern forestry, forest products industries, markets and organizations, including a general survey, Seventy-five years in Southern forestry (*R. E. McArdle*) and regional accounts for Alabama, Arkansas, Carolina, Florida, Kentucky, Louisiana, Mississippi and Texas.

903. Forest Policy, General

3542. DUSCHEK, S. Österreichs Forst- und Holzwirtschaft nach der Waldstandsaufnahme. [**Austria's forestry and wood industries according to the forest survey.**] *Öst. Vjschr. Forstw.* 97 (3/4), 1956 (145–54). [G.]

A lecture, discussing the implications of the published findings for future policy, particularly the best ways of gradually reducing the annual cut from 11·4 mill. cu.m. to the sustained annual yield of 8·5 mill. cu.m. without unavoidable hardship and dislocation for industry. Most of the gap would have to be closed by reducing exports.

3543. BHADRAN, C. A. R. **Forest research and planning for India's forests.** *Indian For.* 82 (12), 1956 (615–8).

Mainly a presentation of the relevant parts of the 2nd Five-year Plan of the Government of India.

904. General Regional Accounts of Forests and Forestry

See also No. 2562.

3544. HADEN-GUEST, S., WRIGHT, J. K., and TECLAFF, E. M. [Editors]. **A world geography of forest resources.** *Special Publication, American Geographical Society, New York* No. 33, 1956. pp. xviii + 736 + 110 photos. Many refs. Price $12.50 (£4. 15*s*.).

A comprehensive work containing chapters on: The importance of forests to man (*P. B. Sears*); The forests of the past and present (*W. H. Camp*); Forest influences (*S. T. Dana*); Principles and practice in forestry (*J. W. B. Sisam*); The forest products industries of the world (*G. M. Hunt*); and a series of chapters on the forest resources of different regions: Alaska (*R. F. Taylor*); Canada (*G. Tunstell*); The United States (*H. R. Josephson* and *D. Hair*); Middle America (*L. R. Holdridge*); South America (*W. R. Barbour*); Northern Europe (*K. T. Streyffert, A. Langsæter* and *E. Saari*); The British Isles (*R. St. B. Baker*); Western Europe (*D. Lowenthal*); East-Central Europe (*E. M. Teclaff*); The Mediterranean region (*G. Giordano*); Tropical Africa (*A. Aubréville*); South Africa (*R. S. Adamson*); The U.S.S.R. (*R. Zon*); Southwestern Asia (*H. F. Mooney*); Pakistan (*S. A. Vahid*); India (*M. D. Chaturvedi*); Ceylon (*R. W. Szechowyz*); Southeast Asia (*R. Sewandono*); The Philippines (*F. Tamesis*); China (*D. Y. Lin*); Japan (*L. J. Cummings*); Korea (*M. S. Hyun*); Australia (*D. A. N. Cromer*); New Zealand (*A. R. Entrican* and *J. T. Holloway*); Oceania (*F. E. Egler*); with a final chapter, The outlook for the world's forests and their chief products (*E. Rostlund*). There are a botanical and a general index, and short botanical bibliographies are given with most chapters.

3545. **Statement by the Forestry Commission of Great Britain prepared for the British Commonwealth Forestry Conference 1957.** H.M. Forestry Commission, London. 1957. pp. 24.

3546. **Statement by the Ministry of Agriculture for Northern Ireland, prepared for the British**

Commonwealth Forestry Conference, 1957. H.M. Stationery Office, Belfast. 1956. pp. 20.

3547. **Statement by the Forest Department of the Federation of Malaya, prepared for the British Commonwealth Forestry Conference, 1957.** Government Printer, Kuala Lumpur. 1956. pp. 11.

3548. **Statement by the forest authority of the Northern Region of Nigeria for the British Commonwealth Forestry Conference, 1957.** Government Printer, Kaduna, Nigeria. 1956. pp. 10 + 1 map.

3549. **Statement by the Forest Department of the Western Region of Nigeria for the British Commonwealth Forestry Conference, 1957.** Conservator of Forests, Western Region of Nigeria. 1956. pp. 12 + 1 map.

3550. **Statement by the Forest Department of the Southern Cameroons under United Kingdom Administration prepared for the British Commonwealth Forestry Conference 1957.** Forest Department, Kumba. 1957. pp. 13.

3551. **Statement by the Uganda Forest Department for the 7th British Commonwealth Forestry Conference, 1957.** Government Printer, Entebbe, Uganda. 1956. pp. 19. Price 1*s.* 6*d.*

3552. **Statement by the Forestry Department of Northern Rhodesia, prepared for the British Commonwealth Forestry Conference, 1957.** Government Printer, Lusaka. 1956. pp. 13.

3553. **Statement by the Department of Forestry, Nyasaland, for the British Commonwealth Forestry Conference, 1957.** Government Printer, Zomba, Nyasaland. 1956. pp. 16.

3554. **Forestry in British Columbia: Statement prepared by the Forest Service for the 7th British Commonwealth Forestry Conference 1957.** British Columbia Forest Service, Victoria, B.C. 1956. pp. 15.

3555. **Saskatchewan's forests 1951–55. Statement presented by the Province of Saskatchewan to the British Commonwealth Forestry Conference 1957.** Forestry Branch, Department of Natural Resources, Regina, Sask. 1957. pp. 27.

3556. **Statement prepared by Ontario Department of Lands and Forests for British Commonwealth Forestry Conference 1957.** Ontario Department of Lands and Forests, Toronto. 1956. pp. 20.

3557. **Forestry in British Honduras, a statement prepared for the British Commonwealth Forestry Conference, Australia and New Zealand, 1957.** Forestry Department, Belize, British Honduras. 1956. pp. 18.

3558. **Jamaica: statement by the Forest Department, prepared for the British Commonwealth Forestry Conference, 1957.** Government Printer, Kingston, Jamaica. 1956. pp. 14.

3559. **Trinidad and Tobago: Statement for the 7th British Commonwealth Forestry Conference, 1957.** Government Printing Office, Trinidad. 1956. pp. 20.

3560. **Statement by the Forest Department of British Guiana, prepared for the British Commonwealth Forestry Conference, 1957.** Forest Department, Georgetown, British Guiana. 1956. pp. 15.

3561. **Forestry in the Colony of North Borneo, a statement prepared for the Seventh British Commonwealth Forestry Conference (Australia and New Zealand), 1957.** Department of Forestry, Sandakan, N. Borneo. 1956. pp. 15.

3562. **Statement by the Forest Department, Sarawak, prepared for the British Commonwealth Forestry Conference, 1957.** Government Printer, Kuching, Sarawak. 1956. pp. 19.

3563. **Seventh British Commonwealth Forestry Conference, 1957: general statistical statement, Western Australia.** *Bull. For. Dep. W. Aust.* No. 62, 1956. pp. 16.

3564. **Statement by the Woods and Forests Department of South Australia, prepared for the British Commonwealth Forestry Conference 1957.** *Bull. Wds. For. Dep. S. Aust.* No. 10, [1956]. pp. 14.

3565. **British Commonwealth Forestry Conference, New South Wales 1957: Forestry in New South Wales 1951–1955: being a statement of the part played by forestry in the economic structure of the State.** Forestry Commission, Sydney, N.S.W. 1956. pp. 16.

3566. **Statement presented by the Forests Commission of Victoria, Australia, to the 7th British Commonwealth Forestry Conference, 1957.** Forests Commission, Melbourne. 1956. pp. 15.

3567. **Statement by Tasmanian Forestry Commission for the British Commonwealth Forestry Conference 1957.** Tasmanian Forestry Commission, Hobart, Tasmania. 1956. pp. 16.

3568. **Colony of Fiji, statement by the Forestry Department, prepared for the British Commonwealth Forestry Conference, 1957.** Government Press, Suva, Fiji. 1956. pp. 13.

3569. FERGUSSON, J. L. F. **Present-day forestry in Perthshire.** *Scot. For.* 11 (1), 1957 (5–10). 4 refs.
Gives figures for acreage, species planted etc., for private and Forestry Commission woodlands.

3570. SKINNEMOEN, K. **An outline of Norwegian forestry.** Det Norske Skogselskap, Oslo. 1957. pp. 104. [E.] Price *Kr.*10.
An illustrated account, with sections on forestry (geography, climate, geology and soil, species, forest resources, ownership, history and present conditions, artificial regeneration and afforestation, damage, economy and policy, felling and transport, labour, administration, legislation, research, education), the pulp and paper industry, protection of nature, organizations, and forestry periodicals.

905. Forest Statistics and Resources

See also Nos. 2398–9, 3247, 3510, 3545–70.

3571. Skogsstatistisk årsbok 1954. **[Statistical yearbook of forestry 1954.]** Kungl. Skogsstyrelsen, Stockholm. 1956. pp. 172. [Sw.e.]

3572. BØRSET, O. Lauvskogene våre. **[Deciduous forests in Norway.]** *Norsk Skogind.* 11 (2), 1957 (55 . . . 63). [Nor.e.] P.R.

Includes tables and graphs showing the relative volume of deciduous and coniferous forest and of deciduous species, and the annual volume increment per ha. for Spruce, Ash, Aspen, Beech and Oak. Since increment of conifers is higher, a higher price for hardwood timber is necessary.

3573. **[Swiss forest statistics for 1954.]** *Schweiz. Forststatist.* 13 (5), [1956?]. pp. 58. [G.F.]

3574. B., P. Forst- und Hölzwirtschaft der Sowjetzone im Spiegel der überwachten Statistik. **[Forestry and forest products industry of the Soviet zone of Germany as revealed by official statistics.]** *Holz-Zbl.* 83 (21), 1957 (255). [G.]

Gives data from the first official statistical handbook published in the Eastern zone, including forest area by ownership categories (ca. $\frac{1}{3}$ in private hands), annual cuts 1946–55 by assortments, reforestation, wood-using industries by ownership, output, and number of workers, foreign trade etc.

3575. **Improvement of forest statistics of India.** *Proc. 8th silv. Conf., Dehra Dun 1951*, Part 2, 1956 (414–8).

Discusses the problems and methods involved in improving the existing forest statistics, notably by extending their coverage to all categories of ownership, increasing their detail (particulars are given) and reconciling conflicting classifications, e.g. as between the Forest and Revenue departments. The present position in each State is briefly reviewed.

3576. **Basic timber resource statistics for the Southern Region as of January 1, 1953.** U.S. Forest Service Region 8, Atlanta, Ga. 1956. pp. 50 + 4 gphs.

Includes data for Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and the forested section of Oklahoma and Texas.

3577. LARSON, R. W. **The timber supply situation in Georgia.** *For. Resour. Rep. U.S. Dep. Agric.* No. 12, 1956. pp. 51 + 1 map. 31 refs.

3578. ROMERO ROBLES, L., and ZEBADÚA, M. Superficie forestal de la República Mexicana. **[Forest area of Mexico.]** *Mensajero for., Durango* No. 147, 1956 (6, 23). [Span.]

Tabulates the area (sq. km.) of tropical/subtropical and temperate forests in 21 states, the totals being 337,827 and 313,909, respectively 17 and 15·8% of the total land area. One-third of the coniferous area has been felled out, one-quarter is exploitable, and the rest exploited but fit for regeneration.

3579. MOERSAID K. SOEDARMO, *et al.* Kewadjiban kehutanan untuk memenuhi kebutuhan industri. **[The task of forestry in supplying the needs of industry.]** *Rimba Indonesia* 5 (1/2), 1956 (1–132). [Jav.e.]

Discusses the need for planning, afforestation schemes, estimated total demand, methods of ensuring sustained yield, and supplies and demand, species and quality needed in the following industries: building, pulp and paper, fuel, tanstuffs, matches, packing material, pencils and chemical products (e.g. resins, gums, turpentine, lac, dyestuffs, phenolic materials from Mangrove bark). *From authors' summary.*

907. Indirect Significance of Forests (Rural Amenity, National Parks, Forest Influences etc.)

See also section 116.

3580. EDLIN, H. L. [Editor]. **National Forest Park Guide: Dean Forest and Wye Valley.** H.M. Stationery Office, London. 2nd ed. 1956. pp. 95.

Includes the following chapters: History (*F. W. P. Hicks*); The Dean Woodlands 1066–1939 (*Sir W. Taylor*); The Dean Forest today (*H. L. Edlin*); Wildlife (*Sir W. Taylor*); Bats of the Dean Forest (*J. J. Walling*); Insect life (*A. H. Popert*); Plant life and vegetation (*E. W. Jones and J. M. B. Brown*); Geology (*T. A. Ryder*); Books on the district (*C. E. Hart*).

908. Relationship to Other Branches of Husbandry and Industry.

3581. AMORY, D. H. **Relations between Forestry Commission and hill farmers.** *Scot. For.* 11 (1), 1957 (26–8, 36).

An address given by the Minister of Agriculture to a press conference, dealing with such subjects as fences, heather and grass burning, vermin, roads and other services.

91. Land Use, Land-Use Policy (Including Afforestation Policy)

See also Nos. 2444–5, 2447, 2817, 2859–60, 2870, 3579.

3582. WESTERMANN, J. H., and ZONNEVELD, J. I. S. **Photo-geological observations and land capability and land use survey of the island of Bonaire (Netherlands Antilles).** *Meded. Inst. Trop. Amst.* No. 123 (*Afd. trop. Prod.* No. 47), 1956. pp. 101 + [30] + 61 photos., 3 maps. 6 pp. of refs. [E.] Price *Fl.*10.

Contains chapters on: photo-topographical observation; photo-geological observation; land-use survey, including a section on woodland production (firewood, charcoal and harvesting pods of *Caesalpinia coriaria*); land-capability survey (including recommendations for tree planting); land use and land policy, and research and development in semi-arid lands; and an annotated bibliography.

3583. **Forestry, agriculture and marginal land: a report by the Natural Resources (Technical) Committee.** H.M. Stationery Office, London. 1957. pp. 67 + 10 photos.

Summarizes the results of an extensive study of the problems involved in increasing the use of indigenous sources of timber, and of the repercussions of afforestation on the agricultural use of marginal land. The following heads are considered: background and outlook for agriculture; background and outlook for forestry and forest products; marginal lands of Great Britain; agricultural development of marginal land; problem of forestry in Great Britain; returns from agriculture and forestry on marginal land; requirements and supplies of timber and cellulose materials; present obstacles to afforestation; case for integration of forestry and agriculture; means of forwarding the forestry programme and integration; problem of the uneconomic farm. There are appendices on: land use in the highlands of Scotland and in Central Wales; examples of costs and returns of improving marginal hill land for agriculture; method of comparing financial returns for agriculture and forestry on marginal land; materials other than timber for pulping; wood-pulp in the Commonwealth and Colonies; examples of integration of forestry and agriculture; and man-made textiles.

3584. HOME, SIR J. H. M. **Land for forestry.** *Scot. For.* 11 (1), 1957 (11–6).

Discusses the acquisition of land by the Forestry Commission, its use, and possible changes in policy.

3585. AUSTIN, T. **Afforestation in the coastal regions of Norway.** *Sylva, Edinb.* No. 37, 1956/57 (9–12).

A short account of afforestation so far carried out, official programmes for the future, seed supply etc.

3586. BASTIDE, R. Reboisement et démographie à l'Aigoual. **[Afforestation and demography at Aigoual.]** *Rev. for. franç.* 9 (3), 1957 (183–7). [F.]

The forests of Aigoual in the department of Gard were created by planting between 1865 and 1880, and cover > 16,560 ha. The effect of this large area of forest in providing paid work, and its repercussions on the dwindling peasant population are discussed in the light of census figures for the communes involved.

3587. MICHEL, U. Quelques répercussions d'un boisement important de communaux sur l'économie d'une commune de montagne en Lozère. **[Some repercussions of a large-scale afforestation of the communal lands on the economy of a mountain village in Lozère.]** *Bulletin de la Fédération Française d'Économie Alpestre, Grenoble (n.s.)* No. 6, 1956 (195–8). [F.]

Discusses the advantages expected from the afforestation of the communal lands (at present poor mountain pasture) of the village of Salces. These include, besides the ultimate revenue from the forest, various alleviations of the financial position of the commune in regard to taxation, state subsidies etc.

3588. BOSC, J. La brebis laitière et le reboisement. **[Afforestation and the milch ewe.]** *Bulletin de la Fédération Française d'Économie Alpestre, Grenoble (n.s.)* No. 6, 1956 (239–42). [F.]

Discusses the peculiar problems of the pastoral industry of the Roquefort region, in which almost the whole population is engaged. Improved husbandry is enabling the cheese industry to obtain sufficient ewe's milk from a smaller area, and the afforestation of the abandoned, poorer pasture could be effected without injury to the pastoral industry.

3589. MATHUR, V. P. **Determination of the minimum land area under forest in India.** *Proc. 8th silv. Conf., Dehra Dun 1951*, Part 2, 1956 (447–54). 9 refs.

Discusses the factors involved in determining a minimum desirable forest area (population, *per capita* consumption and forest area, soil and water conservation etc.), with comparative data from other countries, and some indication of ways in which existing forest can be made more productive.

3590. BANERJI, J. **Intensive land use under forestry.** *Proc. 8th silv. Conf., Dehra Dun 1951*, Part 2, 1956 (482–90).

Discusses the need for determining the economic factors involved when deciding how to use land assigned to forestry—e.g. the relative profitability and social usefulness of fuel plantations, matchwood plantations etc. as well as true forest.

3591. DAS, B. **Problem of fuel and fodder in Orissa.** *Proc. 8th silv. Conf., Dehra Dun 1951*, Part 2, 1956 (504–7).

92. Forest Ownership and Ownership Policy

3592. GORRELL-BARNES, W. L. **Report of the conference on African land tenure in East and Central Africa.** H.M. Stationery Office, London. 1956. pp. 1 + 44. 4 refs.

Covers for the Rhodesias, Nyasaland, Kenya, Tanganyika and Uganda, the need to control the process of change (staff and finance implied), negotiable titles, registration, fragmentation, landlord/tenant relationships, legislative background etc., and makes recommendations.

3593. RAI, R. D. **The control of *Jagir* and other forests after their merger in the state forests [Hyderabad].** *Proc. 8th silv. Conf., Dehra Dun 1951* Part 2, 1956 (480–2).

An account of the taking over of the landlords' forests by the Forest department in 1949–50, with the legal and practical problems involved.

3594. AUGIER, P. W. **Forest economics including management and policy.** *Proc. 8th silv. Conf., Dehra Dun 1951*, Part 2, 1956 (437–43).

Reviews in some detail the history of the Bihar Forest Department, in particular its repeated efforts to gain control of the 79% of the forest area owned by landlords, which culminated in the Bihar Private Forest Act, 1947. The mistakes made and the lessons to be learnt from the struggle are discussed.

3595. Der Bauer und sein Wald. **[The [Austrian] farmer and his forest.]** *Holz-Kurier, Wien* 12 (10), 1957 (5 . . 12, 13–4). [G.]

A special number, with articles on Farm forests, problem children of forestry (*O. Eckmüllner*), and The farm forest in the national economy (*P. Handel-Mazzetti*) with information on numbers and size of holdings, existing conditions, and recommendations for improving yields and utilization.

93. Public Supervision and Regulation of Forestry, including Legislation for these Purposes

See also Nos. 3593–4.

3596. Ley forestal, su reglamento y reformas. **[The forest law [of Mexico], regulations and amendments.]** El Mensajero Forestal, Durango, Mexico. [1952] pp. 104. [Span.]

Excerpts from the official gazette cover the 8 chapters of the forest law of 1948 (protection of resources, forest service, regeneration, forest fund, registration of forest holdings, fire protection, crimes and misdemeanours. Regulations (19 chapters) cover in addition forest sanitation, research, education and extension work, inventory, wood preservation, export etc. A decree transfers the powers of the national forest council to the Secretary of Agriculture.

3597. **Honduras: Legislative Decree No. 184. The Forestry Act (16 Dec. 1955).** In *Food agric. Leg.* 5 (1), 1956. pp. 17.

The law relates to state, communal, and private forests, and in addition to general administration, protection, and timber concessions, and deals with the establishment of protection forest and forest reserves and the regulation of resin tapping.

3598. SCHWARZ, H. Gesetzliche Bestimmungen über die Wald- und Weidenutzungsrechte in Österreich. **[Laws and regulations on rights [servitudes] to forest produce and pasture in Austria.]** *Öst. Vjschr. Forstw.* 97 (3/4), 1956 (173–213). 21 refs. [G.]

Discusses the historical development of various forest rights arising from former systems of land tenure, and the development of legislation, dealing with definition, regulation, redemption, and commutation. Includes some data on the extent of the problem and an annexe reproducing the latest enactments of the Federation and of the Salzburg province.

94. Other Methods to Implement Forest Policy

945.1. Advisory and Information Services; Documentation Centres

3599. Z., F. Die forstliche Betriebsberatung auf neuer Grundlage. **[A reorganization of the forestry advisory service.]** *Wald u. Holz* 7 (3), 1957 (166–9). [G.]

Describes recent changes in the organization of the Working Group for Forest Advisory Services, originally formed by representatives of the Swiss forestry, wood, and paper industries to improve logging and transport techniques, and its programme, which now aims at training special advisers among the forest departments' staff, the costs to be borne partly by the departments, partly by the working groups, and partly by the users of the service.

3600. BROWN, N. C. **Consultant foresters [in the U.S.A.].** *Wood* 22 (1), 1957 (18).

There are now about 400 employed, mainly in the N.W. and S. Their work covers appraisals, surveys, maps, estimates of growing stock and increment, management, logging and fire-protection plans, pest control projects, litigation, assessment of damage, tree-farm management etc. Methods of remuneration are indicated.

3601. WAGENKNECHT, E., *et al.* Eberswalde 1953. Wege zu standortgerechter Forstwirtschaft. **[Eberswalde 1953. Roads to a site-adapted forestry.]** Neumann Verlag, Radebeul and Berlin. 1956. pp. 523. 410 refs. [G.] Price *DM*.32 [£2. 17*s*. 6*d*.]

A detailed description of the Eberswalde instructional forests, for which new working plans were completed in 1953, is combined with an exposition of management and silvicultural principles, and their practical application, so that the book may serve as a textbook for regions with comparable conditions. Part 1 (*A. Scamoni*) contains a description of topography, soils, and forest plant communities, preceded by a chapter on climate and followed by one on the yields of main species based chiefly on mean stand-height for the various site-types distinguished (*E. Wagenknecht*). Part 2 describes the management principles applied, with data from the surveys carried out—species, age, basal area, volume distribution etc. (*A. Richter*), their practical implementation and the steps in planning, including the formation of site management-classes (*J. Lehmann*). Part 3 (*E. Wagenknecht*) deals with the establishment and tending of the chief species, mainly Pine, by types of stocking, of which 12, chiefly mixtures, are distinguished, and according to product aimed at, i.e. sawtimber, mine timber etc. Part 4 (*E. Wagenknecht*), discusses the silvicultural treatment of the various site types. The new plans envisage a considerable reduction in Pine, chiefly in favour of Spruce and Douglas Fir, and in Beech, chiefly in favour of Red Oak.

945.3. Education. Training. (Including Educational Tours)

3602. ZIVNUSKA, J. A. **Forestry education in Northern Europe.** *J. For.* 55 (2), 1957 (105–14). 5 refs.

Notes on forestry education in Norway, Sweden, Finland and Denmark, the fruit of short periods of study in those countries.

3603. PERSON, H. L. Informe provisional al gobierno de Chile sobre el Centro Forestal de Investigación y Capacitación de Llancacura. **[Provisional report to the Chilean government on the Centre for Forest Research and Training at Llancacura.]** Expanded Technical Assistance Program, FAO, Rome. No. *FAO*/56/6/4295, 1956. pp. 33. [Span.] Limited distribution.

The Forestry Centre at Llancacura was first inaugurated in 1952 as a result of collaboration between FAO and the Chilean Government, and was officially opened in 1955. Its aims are to study the silvicultural methods best adapted to Chilean conditions and to train personnel. The report

covers work already accomplished and makes recommendations for the future.

945.4. Research

See also Nos. 3262, 3543, 3603.

3604. SINGH, J. A., and QURESHI, I. M. **Role and contribution of Forest Research Institute, Dehra Dun, in regard to silvicultural research in Bombay State.** *Indian For.* 82 (12), 1956 (628–31).

3605. VENKATARAMANY, P. **Thirty-seven years of silvicultural research in the Madras State, 1919 to 1956.** *Indian For.* 82 (12), 1956 (637–43).

3606. WINTERS, R. K. **Forestry problem analysis and research programme for East Pakistan.** *Pakistan J. For.* 6 (4), 1956 (259–88).

Reviews the general state of forests and forestry, analyses in detail the research projects in progress and others that are desirable, and indicates priorities in subjects for research.

3607. MORANDINI, R. Rapport au Gouvernement de l'Iran sur l'organisation de la recherche forestière. **[Report to the Government of Iran on the organization of forest research.]** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 561, 1957. pp. 26 + 1 dgm. [F.]

3608. **[Organization of federal and regional forest research.]** *Rep. For. Adm. West. Reg. Nigeria 1954/55*, 1956 (18–9).

A federal natural-resources council with members from the regions and from University College, Ibadan, is to be advised by departmental subcommittees, that for forestry consisting of the Chief Conservators, under the federal Director of Forest Research. A meeting of this committee in 1953 discussed *inter alia* its terms of reference, field of research and the long-term programme, the provisional proposals for which are outlined.

3609. **Directory of current woodlands research and experimental work in the Canadian pulp and paper industry.** Pulp and Paper Research Institute of Canada, Montreal. 1957. pp. 271.

Loose-leaf sheets have been issued, supplementing and revising the directory to 1956 in a complete reprinting [see *F.A.* 17 No. 3544]. The industry now has 260 project reports. A summary analysing subjects and sponsoring organizations has been adopted.

3610. **Directory of current woodlands research and experimental work in Canadian Universities.** Pulp and Paper Research Institute of Canada, Montreal. 1957. pp. 66.

[Cf. preceding abstr. and *F.A.* 17 No. 3545.] This directory is similarly revised to 1956. The Universities now have 66 project reports.

3611. BENT, J. H. **The Causapscal Forest Research Station.** *Texte Conf. 36e Assembl. ann. Corp. Ingén. for. Québec* 1956 (54–62). [E.]

An account of the station and some of the current research projects.

3612. ISRAELSON, M. A. **Publications of the Intermountain Forest and Range Experiment Station 1953 through 1955 and the Northern Rocky Mountain Forest and Range Experiment Station 1951 through 1954.** *Suppl.* to *Res. Pap. Intermt. For. Range Exp. Sta.* No. 29, 1956. pp. 35.

Publications are grouped under the headings of general forestry, forest economics, management, protection, survey, utilization, and range, watershed and wildlife management.

946.2. Conferences and Excursions

See also No. 2786.

3613. **Proceedings of the 8th silvicultural conference, Dehra Dun, December 5th to December 14th, 1951. Part 1, Proceedings.** Forest Research Institute, Dehra Dun. 1956. pp. 259.

Gives abstracts of papers, followed by reports of discussions. The full papers are published in a separate volume and are abstracted separately in this issue of *F.A.*

3614. **Fourth all-Australia timber congress.** *Aust. Timb. J.* 22 (12), 1957 (65 . . . 252).

The entire issue is devoted to the programme, resolutions, and 21 papers read, mainly dealing with the economics and technology of the Australian forest industry. There are many illustrations.

96. Forest Labour Questions. Labour Questions in Wood Transport and the Wood Industries

3615. WORRELL, A. C. **[U.S.] Government social programs and forestry.** *J. For.* 55 (3), 1957 (179–84). 9 refs.

Briefly describes federal and state laws governing wages and hours, old age and unemployment insurance, and workmen's compensation as they affect the forestry industry, and discusses the financial implications of these laws for employers.

97. International Forest Policy and Other International Collaboration

971. Congresses, Conferences

See also No. 3492.

3616. ROBERTSON, W. M. **A note on the first three Empire Forestry Conferences held in the United Kingdom, Canada, and Australia and New Zealand.** *Emp. For. Rev.* 36 (1), 1957 (43–54).

Summarizes the work of the first 3 conferences, held in 1920, 1923 and 1928.

3617. ALLEGRI, F. La conferenza mondiale dell' eucalitto. **[The World Eucalypt Conference.]** *Monti e Boschi* 8 (1), 1957 (3–16). [It.]

A short account of the conference (Rome, 1956) and the subsequent study tours in S. Italy and Sicily.

972. Organizations

3618. PAVARI, A., BIRAGHI, A., and BREVIGLIERI, N. L'attività della Commissione Internazionale del

Castagno. **[The activities of the International Chestnut Commission.]** *Pubbl. Cent. Stud. Castagno, Firenze* No. 3, 1956 (49–74). [It.f.e.g.]

An account of the origin of the Commission, problems discussed and studies in progress.

3619. HARDEE, J. H. **The forestry phase of the United States technical assistance program in Chile.** *Carib. For.* 17 (1/2), 1956 (28–36). 1 ref.

A sketch of 3½ years' work, including the construction of a 25-million-seedling nursery, scattered ½-acre plots of 57 species under test, an important catchment control scheme, sand-dune stabilization, and training and extension work. Eleven species thriving on stabilized dunes are named.

FORESTRY THE WORLD OVER

References: 1. *Circular Letter, International Union of Biological Sciences*; 2. *CPPA Newsletter*, Montreal; 3. *ČTK Bulletin*, Prague; 4. *FAO Press Release*, Rome; 5. *Fire Control Notes*, Washington, D.C.; 5. *Forests and People*, Alexandria, La.; 6. *Forst- und Holzwirt*, Hanover; 7. *Holz-Kurier*, Vienna; 8. *ISTF News Letter*, Washington, D.C.; 9. *IUPN Bulletin*, Brussels; 10. *Newsletter, N.Z. Forest Service*, Wellington, N.Z.; 11. *Revue Forestière Française*, Paris; 12. *Southern Lumberman*, Nashville, Tenn.; 13. *Timber Trades Journal*, London; 14. *Unasylva*, Rome; 15. *Wood*, London.

International. At a meeting of the International Society of Bioclimatology and Biometeorology held in Paris in Sept. 1956, it was decided to set up a committee for 'ecological climatography', to compile information on biological standards to be used in defining climates. Dr. Boyko (Israel) is chairman of the new committee. The first regular bioclimatical congress of the Society is to be held in Vienna in August or September 1957 (**1**; Dec. 1956).

Among the topics to be covered at the Ninth Pacific Congress to be held 18 Nov.–9 Dec. at Bangkok are several of forestry interest: forest botany in the Pacific Basin; plant ecology in the Pacific; effects of shifting cultivation on natural resources; methods of land classification; afforestation of *Imperata* waste-lands; natural regeneration of tropical monsoon forest; natural rubber and natural gums and resins. In addition, a special symposium on humid tropics research will be held with the assistance of UNESCO, dealing with climate, vegetation, and land utilization in the humid tropics (**8**; 30.4.57).

FAO. A broad programme aimed at breaking the 'vicious circle of poverty' in 12 countries bordering the Mediterranean has been outlined to the Council of FAO. The programme proposes large-scale reforestation and schemes of land and water conservation as a step towards the economic and social development of an area where poverty 'engulfs much of the land' and the people who live on it. The programme embraces all Mediterranean countries, but will concentrate initially on those in the Central and Eastern Mediterranean areas, from Tunisia and Sicily in the west to Iraq in the east. In the case of southern European countries, FAO will work in co-operation with ECE. The preliminary work of collecting available data is going forward under a British economist, Dr. T. Balogh, who will prepare the interim report for the Conference with the help of a Mediterranean Study Unit which is being established at FAO Headquarters. The restoration of the forest cover has been selected as the starting point of the programme. 'A vigorous forest policy might, with related public works, provide a means of training for better skilled manpower, which is an indispensable precondition of expansion in agriculture and industry' (**4**; 6.6.57).

A study group on prevention of forest accidents met in Geneva in March under the sponsorship of the joint secretariat of ECE and FAO. It recommended the introduction of a standard system of reporting accidents in the work of logging, one of the world's most dangerous occupations. In many countries the collection, compilation, and analysis of statistics on forest accidents is inadequate, and a guide is being prepared (**4**; 18.3.57).

The sessions of the Near East and Latin American Forestry Commissions due to be held in 1957 have been deferred until 1958 (**14**; April 1957).

Austria. In connexion with the campaign to economize in the use of wood, a demonstration centre for the patented Polda system of wood burning has been opened near Graz. This system, equally suitable for cooking and heating stoves, industrial and central-heating furnaces, will burn sawdust, logging waste, fuelwood, or lignite, and is said to have a calorific efficiency of ca. 80%. It is based on the principle of a radiating cone instead of the traditional horizontal grate, and uses secondary air currents to effect complete combustion of gases within the combustion chamber (**7**; 18.5.47).

Czechoslovakia. Work is in progress on the 5-year plan aiming at planting by 1960 an area of 750,000 acres deforested during the second World War by excessive felling, insects, frost, and storm damage. In 1956 an area of 100,000 acres was planted with some 400 million trees. In addition to this work of reforestation, it is proposed to afforest 100,000 acres of land unsuitable for agriculture, with rapid-growing species, including Poplars and Willows (**3**; 1957).

Finland. Under the recent Nature Protection Act, 12 nature reserves and 7 national parks are to be set up, covering examples of different landscape types characteristic of the country; peat bogs, forests, and parklands (**9**; May 1957).

France. For the purposes of a breeding programme being carried out at the Arboretum of Les Barres, an expedition was sent to Corsica to obtain graft material from 28 specially selected Corsican Pines 40–50 m. high. Scions must be taken from vigorous shoots of the current year situated at the top of the tree, and for 16 of the trees this involved the use of 30 m. of ladder, while the tallest necessitated the use of 38 m., a record in France. The material was packed in polythene and flown direct to Les Barres, where it was received and grafted 48 hours after collection (**11**; May 1957).

Germany. An experimental method of fighting the ravages of the barkbeetle *Dendroctonus micans* on Norway and Sitka Spruce in Schleswig-Holstein has proved highly efficacious. It consists in applying a poison to the trunk. In the first year after initial application there was a 50% reduction in infestation, and after a second application, in one district, only 45 cu.m. of infested timber had to be felled compared with 350 cu.m. in preceding years. The communities of beetles were also greatly reduced, and fresh attacks have become rare. The cost of treatment was more than compensated for by the non-interruption of normal forestry work due to the need for felling infested trees (**15**; April 1957).

At an international conference on railway sleepers held at Munich in March 1957, technical and economic data on wooden and concrete sleepers were prepared, without any marked general superiority of either type being proved. Wooden sleepers were considered better for lines carrying very heavy loads (> 60 tons), and concrete sleepers, which are more durable, for lines where loads are < 40 tons (**7**; 28.3.57).

Great Britain. The Timber Development Association and the British Wood Preserving Association have been collaborating in a study of the resistance of various timbers to marine borers. When the tests were started, it was thought that *Teredo* would be the chief subject, but investigations revealed that, while *Teredo* is a serious agency of destruction in British coastal waters and is apt to attack underwater timbers in wharves, jetties, etc., another pest requiring close attention is the gribble (*Limnoria* sp.). The gribble is being taken into account in devising a new series of fendering tests in Poole Harbour (**15**; April 1957).

The *Mayflower II* was built largely from Devon-grown Elm and Oak sawn in Devon sawmills, more than half of it in a sawmill at Moretonhampstead. The timber includes deck beams 26 ft. long by 15 in. square. The outside planking was mainly 2½ in. thick, 1 ft. 6 in. to 2 ft. 6 in. wide, and up to 30 ft. long. The largest log sawn for this project was an Oak weighing more than 5 tons (**15**; April 1957).

The Admiralty is sponsoring trials of laminated ships' decking with a Teak face and a backing of more easily available timber, e.g. Agba [*Gossweilerodendron balsamiferum*]. By the use of splicing, the decking can be made of any length and is not limited to the length of timber available. Two ships have been fitted with laminated decking as an experiment (**13**; 27.4.57).

New Zealand. For the purpose of obtaining reliable information on the resistance of treated timbers to insects and fungi under service conditions, the Cawthron Institute has erected an experimental building, 20 ft. square, on continuous concrete foundations and piles, with a weatherboard exterior and corrugated iron roof. The timbers used are *Pinus radiata*, *Beilschmiedia tawa*, *Dacrydium cupressinum*, *Podocarpus spicatus* and *P. dacrydioides*, treated with 4 commercial preservatives, and comprehensively dispersed and replicated throughout the building. *Anobium punctatum* is being used as the main test insect and many thousands have been liberated in the building (**10**; March 1957).

Republic of Ireland. The Forestry Estimates for 1957–8, framed by the outgoing government and recently introduced in the Dail by the new one, amount to £1,941,000, an increase of £118,200 on those of the previous year. The previous government was defeated last December on its opposition to a private motion which demanded the transfer of state afforestation from the Department of Lands to a separate ministry or state-sponsored body (**13**; 4.5.57).

Sweden. Seed collectors in Västerbotten use balloons for their work. A light one-man gondola is attached to a pair of small cigar-shaped balloons, which are pulled along and guided by ropes from the ground. The method is said to be safer than climbing, avoids damage to the tree, and is not expensive (**6**; 1.6.57).

U.S.A. The State Forester of Oregon is authorized by law to prohibit the use of fire in any form or the use of power-driven machinery on forest land west of the summit of the Cascade Mountains during periods of critical fire danger. These periods occur when there is a combination of critical fire weather

and an excessive amount of forest fuels. Closing down of logging operations causes a tremendous economic loss to the State and, to minimize this, Western Oregon was divided in 1952 into 16 close-down zones, each of which was considered to have a weather pattern of its own that might at times vary from the others. After the first year's experience, 2 of these were subdivided, making a total of 18 zones, in each of which there is a fire weather station recording data throughout the day; on the basis of these data, transmitted daily to the State Forester's office, determination of close-down periods is made (**5**; Jan. 1957).

A forester in Louisiana has developed a new method for control of brownspot disease in Longleaf Pine. He sprays the seedlings with Fermate from a jeep equipped with two pressure guns. A small pump is mounted on the front end of the jeep to power the sprayers, and the driver and a passenger both spray. The total cost of spraying is $< \$0{\cdot}50$/acre, and one outfit covered 1600 acres of direct-sown Longleaf on disked strips last spring. The treatment gave good control of the disease (**5**; March 1957).

Experimental work at an agricultural experiment station in Tennessee suggests that electric shock treatment may have applications in forestry. Germination has been accelerated or retarded at will by the use of low-frequency electric current (**5**; March 1957).

The Battelle Institute, Cleveland, Ohio, has a research programme on barking, and it is believed that a successful method has been discovered for separating bark from wood by a new flotation process (**2**; Feb. 1957).

The new Hugh P. Baker Laboratory at Syracuse College of Forestry, costing $3,500,000, has been financed by 24 companies, who are co-operating with the University in its maintenance. The laboratory provides facilities and equipment for the investigation of all branches of wood science, including chemical aspects. One wing has a wood-preservation laboratory, a battery of kilns, a sawmill, timber-testing laboratory, and a full range of modern woodworking machinery (**15**; April 1957).

A prototype coastal minesweeper recently launched by the U.S. Navy is claimed to be the first vessel in which pressure-treated timber (laminated and solid) is used throughout. The use of treated Red Oak, which is naturally only half as durable as White Oak heartwood, would almost double the supply of the high-grade Oak required by the Navy (**13**; 27.4.57).

A rat-proof paper/plywood laminate is being used in flour warehouses. The paper is impregnated with asphalt and resin (**12**; 15.5.57).